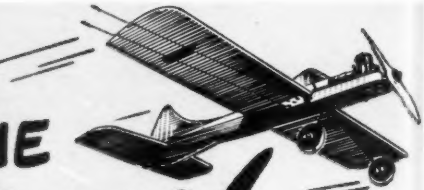
MODEL AIRPLANE NEWS

SEPTEMBER 1953—25 CENTS

GEE BEE SUPER SPEEDSTER

GUILLOW'S



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N.A. P-51 Mustang
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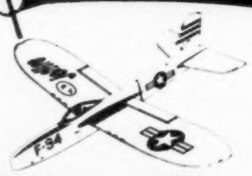

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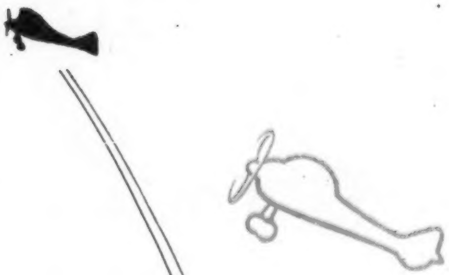

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MODEL AIRPLANE NEWS

Serving Aviaton 24 Years

SEPTEMBER 1953 Vol. XLIX—No. 3

CONTENTS

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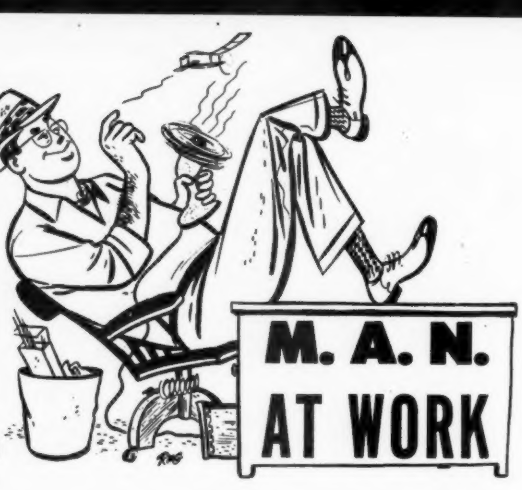


by William Winter

▶ On a lovely spring evening, when any sane citizen would have been out flying model airplanes, sat in on a pre-Nationals "smoked-filled" room session at the Willow Grove Naval Air Station where, from July 27 to August 2, will be held the 22nd National Model Airplane Championships. Matty "Nylon" Sullivan presided—the Navy really presided but Matty was doing the briefing. A couple of dozen old time leaders were on hand to accept responsibilities of running the various events, etc. By banquet night they will look like zombies!

• • •

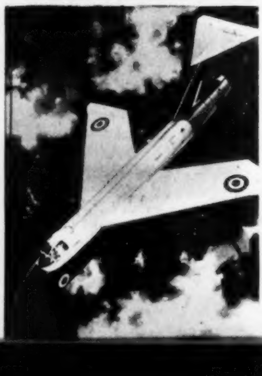
▶ With the exception of the Commander, the Naval officers were in civvies and appropriately wore fancy cowboy boots. A confident take-hold group if we ever saw one. At one point the Commander said he had to know how many people were coming and Bernie Paul piped up that they'd better allow for 3,000. The Commander calmly said in an aside to his assistants that "we'll have to sleep them 611." After a long silence some innocent asked what in heck was 611. He had heard of all the Navy jargon but this was a new one on him. "Six-eleven is the highway outside," the Commander told him. The uproar had hardly died down when there was a great blowing of horns, jangling of bells and furious scurrying around. A fire in a Naval Air Station produces a repel-boarders' frenzy, all very efficient, understand, but an enthusiastic break from routine, nonetheless. This fire didn't amount to a hill of beans but it certainly made us feel at home, for wasn't it during the awarding of the trophies last year that the smoke eaters had to pry us out of the station theater at Los Alamitos?

• • •

▶ Matty Sullivan, who had us down for the meeting, supplied the wheels for our traveling about, a shiny new Cadillac. The way Matty tools this job around you couldn't (*Continued on page 4*)

PLANE ON THE COVER

One of the greatest racing planes of all time, the 1932 Gee Bee Super Sportster, finds cover artist, Jo Kotula, in rare form. The job shown was flown to a world's speed record by Jimmy Doolittle —294.2 mph, on September 3, 1932. Beginning with single seat sport jobs in 1930, Granville Brothers' products had a meteoric rise to fame with the Super Sportster in 1931, followed by the thickened fuselage jobs of 1932. A Pratt & Whitney 800 hp Wasp drove the 25-ft. machine. It took a fearless man to fly one. Full-size plans of 1931 Gee Bee are available. See page 41.



NEXT MONTH'S COVER

The Short SB-5 is one of England's newer research planes for testing various configurations at high speeds. SB-5's specific job is to check various degrees of wing sweep and stabilizer placements. Tests have been made with as much as 50 degrees sweepback. Power is a Rolls-Royce Derwent.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HERKY
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OK CUB .049B
For the beginner or the expert. A brand new, lighter, more powerful "OK" .049 CUB. Both radial and lug mountings — fast starting and higher speed — extended prop mounting for safer operation. Provides maximum output at higher RPM. See it now!
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Enjoy the thrill of building your own engine with this precision assembly kit. Only $4.95
Outstanding ½-A
Rugged — easy to start — greater power.
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Unmatched for stunt and speed flying.
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Sensational for powerful performance in Class A.
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Quicker Starting, Faster Accelerating!
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Long-lasting platinum glow element assures easy starting, higher speeds. ¼-32 longs and shorts for all engines. 59c
See your Dealer or Write Direct: HERKIMER Tool & Model Works 88 Harter Street Herkimer, N. Y.

M.A.N. at Work

(Continued from page 2)

slip a piece of 3/32 in. sheet between its fenders and the guy alongside. Not a reckless driver, Matty; nevertheless, could park the thing in a packing case. Turns out he was a midget driver in his younger but not better days. When he married, Mrs. S. made him swear off the midgets. In a mood to end it all (writers' license, that) he stopped to watch a model auto race, got a whiff of the burning castor and so here we were in a shining Caddy. It isn't that easy, as anyone who started from scratch in the model business can tell you.

• • •

▸ So Bernie Paul put us in his new home in the country where it was so quiet even the owls didn't give a hoot. Persuaded Bernie to show us what it takes to be a distributor. Recommendation to manufacturers: become distributors. No fooling, this is the most incredible thing we've seen since the war. After an hour's inspection of row after row of packed shelves and bins, Bernie summed it up: "Who buys it all?"

• • •

▸ Remembering the frightful weather that plagued the Wakefield eliminations in the East last year, resisted the temptation to visit the quarter finals at the Solberg-Hunterdon Airport in Whitehouse, N. J. The skies opened and it blew a gale. Got a long distance call in the middle of the day from a dejected Del Gatto pleading to bring along his spare wing if we were coming down. Afterward, a call from Bob Hatschek, to say he, Querman, and Bill Fletcher had made out okay, and that Frank Ehling was the only one to make the grade in FAI. The only one! What is this, an elimination by job lots? Van Wymersch lost his Wakefield after a perfect flight. Thought you gave up last year, Van? At one point Hatschek was squishing through the woods a mile downwind, looking for his Wakefield, someone else's ship in hand (he had found it accidentally) when Bill Fletcher's plane came down nearby. Contest models fly too far. Their performance is too high. Fields aren't big enough to contain them. Too much bad luck and bad breaks. If there were a counterpart in golf, let's say, Ben Hogan's ball would roll down a gopher hole. He would then be advised to come back next year provided he could place in the eliminations.

• • •

▸ Spent a few hours with Artie "Consolidated" Hasselbach; new ideas are keeping him as busy as six men in a circle. One is the RC Space Kitten, an air boat consisting of a hull built from well prefabricated pieces upon two normal pontoons. The thing skips over the water like a scaled stone. Like so many guys who are building RC boats because they can's lose them, Artie prefers always to get the ship back, even if he has to row after it. It also has scared the feathers off a few thousand ducks who sit down in the sanctuary of New York City waters. Had with him a sample of the new .60 speed engine slated for production next year. Weighs 9-3/4 oz., so that a C and D speed job of all-metal construction weighs 20 oz. Artie has this one turning 26,000 on a flywheel—which is about the level where the engine roar becomes a shrill whine preparatory to going beyond the normal range of hearing. When the engine stopped, all the empty oil drums, bottles, and cans in the test shed kept reverberating. Reminds us of the time Ray Arden ran a .19 for us at 23,000. Brother, we wanted out!

But the real dilly is a coffee table, a 24 x 48 in. prefabricated kit. Under the glass top is room for a set of scale trains, miniature houses, and painted on, reliefed landscaping. Lights up, too. Kit includes track, switch, all lights, etc. Calls it Tabletown. So it doesn't fly? If it's flying you want, Artie says his 23-1/2 prefab Stuka is a good flying scale ukie entry.

• • •

▸ More tall stories from Don McGovern, who handles Bill Effinger's advertising art, kit plans, etc. Don's also building test models and that Chris-Craft cruiser with the flush deck for carrier operations. Helicopters, which Berkeley is pushing, was the subject. Don says that they may tilt a little forward, in which case they take off cross-country, only to fetch up suddenly in a slight swooping climb, like a mild stall approach on a conventional job. So we shift that CG by radio control? Then his boss came by with a sample of the Si-lo-jet kits which contain three good-sized profile, all balsa scale type gliders equipped with holders for the Jetex 50. If you bust one, you still can fly! You also get the Jetex unit. MAN at work vouches for their flying ability. Kids went for them.

• • •

▸ Speaking of trade items, a few items given to us for testing lately are well worth mentioning. Fuel in cases like pop in an ice cream parlor. Particularly curious about Irwin Ohlsson's new Gold Seal, both the 200 and the Half-A. Well, last Sunday was a scorcher. Only mad dogs, Englishmen, and MAN at Work were out at midday. Flying—forgive us, oh, District VII Newsletter—a new windy Joe with an Arden .19. Days like that, most power fuels crackle and pre-ignite, even with cold plugs. The Gold Seal 200 started with the first flip on some flights, ran smoothly, and had plenty of power. Our particular RC group flies in all weather from bitter January days to the dog days of Summer and there is not a fuel that will start easily when the thermometer is low and still run without crackling on a really hot day. Unfortunately, it will be some time before the 200 can be given the freezing weather test, but did note that when the prop was moved past the firing point, but held firmly, the engine kicked it loose in the hand. After a very small prime with piston up, positioned prop gingerly, and then hit it rather than flip it. Most cases it roared right on. So it should be good for cold weather starts.

Also have found K & B Supersonic 1000 "hot" but cool running fuel, that works well when the mercury nears the top of the glass. Powermist in the green can is a terrific starting hot fuel in really cold weather and never fails to start when used with a hot plug like a Spitfire or Atwood. On hot days have been using such fuels as Spitfire Brown Can with cold plug like the OK. Then, in Buffalo, deBolt got us to use a popular fuel with an OK plug. Good fuels all of them, and that goes for the many not mentioned, too, but you have to know your engine and then consider the type of flying to be done.

Some sample kits, too. Top Flite's new Jigtime catapult gliders. Interesting reaction here. These are built-up models involving quite a few pieces, all die cut and color printed. Gave a dozen of these — Sabres, Migs, and Cutlasses — to neighborhood kids whose biggest thrill came from successfully putting something together. Thought that today's kids had to have the model completely done for them?

Lew Andrews' Beam, the RC kit by Guillow. The structural design is so skilfully handled, and the prefabricated parts go together so well, that we must mention this kit a second time. The Beam will make an ideal sport model for small field flying when used without a radio. Free-flighters would do well to investigate the Beam. As an RC, it is reliable.

One of the cleverest recent kits of interest to Jetex fans is the semi-scale McDonnell

(Continued on page 8)


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PLUS ALL ACCESSORIES AND BONUS EXTRAS
YOU NAME IT — WE SUPPLY IT!
MAKE UP YOUR OWN FLYING OUTFIT if you wish! Name your own combination of ANY ENGINE AND PLANE listed on the opposite page or advertised ANYWHERE in this magazine. We'll supply it and throw in our SPECIAL BONUS items at no extra cost. Just order from us or write for price.
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You'll love this beauty with carved lower fuselage-half, fully formed aluminum upper half, balsa sheet wing (no tissue used), balsa tail surfaces, plywood engine mount, rubber wheels. Comes with schematic drawings with step-by-step plans, detail paint schemes. 24" Wingspan.
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CHOOSE ONE $15.00
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READY-TO-FLY-PLANES
AEROMITE $9.95
A really beautiful red plastic job. 17" wingspan with AA Glo Engine, Prop Spinner, Tank, etc., already installed. Shock-absorbing spring-steel Landing Gear, Jim Walker U-Control for precision and stunt flying, plastic Control Handle, Nylon Control Cord.
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You can't beat this beautifully finished and painted "baby"—she's even fuel-proofed. 19" wingspan. Includes new "slow-motion" propeller and engine.
A J FIREBABY BIPLANE $9.75
It's a terrific stunt ship—this biplane version of the famous FIREBABY. 19" span. Painted and fuel-proofed. Complete with Supercharged Royal Spitfire engine.
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$5.95 Choice of
YANK 23½"
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Top notch performers. All balsa free-flight championship models. Equipped with O.K. .039 engine and all accessories.
TURN PAGE FOR MORE AHC SUPER BARGAINS AND HANDY ORDER FORM

M.A.N. at Work

(Continued from page 4)

Voodoo, put out by American Telasco. The fuselage consists of a two-piece balsa shell that fits together along the center line. These shell pieces are of thin sheet, ready for joining. Overlap material allows use of spring type clothespins while the cement dries. Wing and tail are sheet.

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▶ Flying site problems? Mr. J. Dunkerton, Secretary, Model Aeronautical Assn., N.S.W., Australia, has a suggestion. Speaking of a fund-raising show for charity, he comments, "I don't know if any of your American clubs do the same thing, but we find that, aside from the not inconsiderable amount of money which we raise each year for charities, our actions in so doing give us a very good standing with local and municipal bodies, so that if, as often happens, complaints are made about engine noise, we meet with a lot of support from the right quarters."

• • •

▶ Club Notes: Numbering 57 members within an 18-month period, the Victoria, Tex., Prop Busters got their start when five modelers ran an ad in the local paper, offering $25 for the best club name suggested. With the suggestions came 15 additional members. Needing a sponsor, the group went to the Plymouth dealer. Now meet every Thursday night in his showroom and he boosts the kitty every month. Area modelers contact L. Yaringer, P. O. Box 541, Victoria . . . Mackayville, Quebec, new club with 26 members: contact R. O'Connor, 1872 George St., Mackayville . . . Letter from Waterloo, Ia., Prop Twisters states that they canceled their seventh annual contest for lack of adequate flying space for such a large contest and also a manpower situation.

• • •

▶ Among surprise visitors this month was Dick Carlstein, from Argentina, who talked knowingly of Torps and Hell Razors. He has turned better than 130 in A. Lack of nitro methane is the principal reason why most foreign speed marks lag behind our own. Dick says the stuff is very expensive in his country and has to be made up specially for the flier. Model goods ordered from the States takes three months by boat, three weeks by air. What with shipping expenses, imports, etc., to contend with, the Argentine modelers have to make real sacrifices to pursue the hobby.

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▶ Whenever we catch a printed error in such a paragon of accuracy as "The New York Times," take fresh encouragement, for avoiding errors is not as simple as would be supposed. For example, Ted Martin mentions .720 specific gravity ether, available at drug stores. A phone call to one of the largest chain druggists in the city produced the statement that they sold ether made by the Blank Co., and didn't even know what was said on the label. The Blank Co. in turn knew that they made diethyl ether but little else. A drug trade magazine had no info on hand but passed the ball to a pharmacist-consultant who was out of town. His assistant, however, found unnumbered titles for ether in a book, diethyl among them, then conceded that they all added up to the same thing. He did say that the specific gravity was precisely 0.7199! Ends the memo from the editorial assistant in charge of wild goose chases: "Oh, well!"

• • •

▶ Judged an RC contest Sunday. This is a proposition calculated to drive strong men to gurgling glow fuel. Contestants launch, then run to transmitters on cars and call maneuvers you can't hear, while the crowd goes "Ah!" May announce an S-turn (axis right angles to axis, if you know what we mean. In short, they don't savvy rules. END

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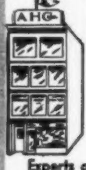

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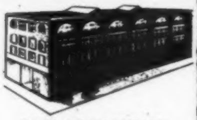

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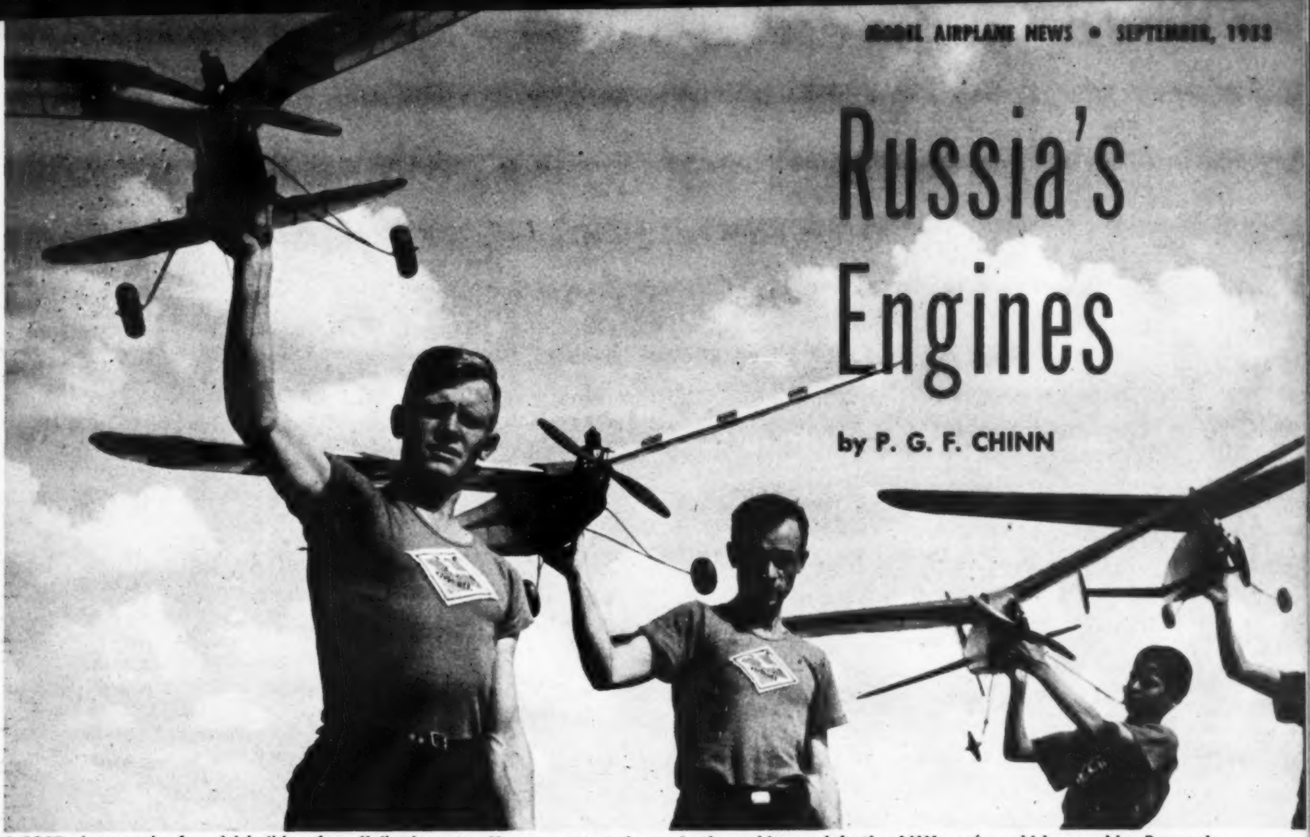


Russia's Engines

by P. G. F. CHINN

A 1947 photograph of model builders from Kuibyshev at a Moscow contest shows, in three ships on left, the AMM engine which resembles Brown Jr.

With the help of Continental informants, the author assembled this impressive report. Numerous FAI records are held by these motors.

Although the U.S.S.R. holds a lot of model aircraft records officially recognized by the Federation Aeronautique Internationale, nothing has so far been seen of Russian models or model builders at FAI sanctioned international contests in Europe. Not even in other countries in the Soviet sphere of influence, such as Eastern Germany and model-conscious Czechoslovakia, do the Russians ever put in an appearance.

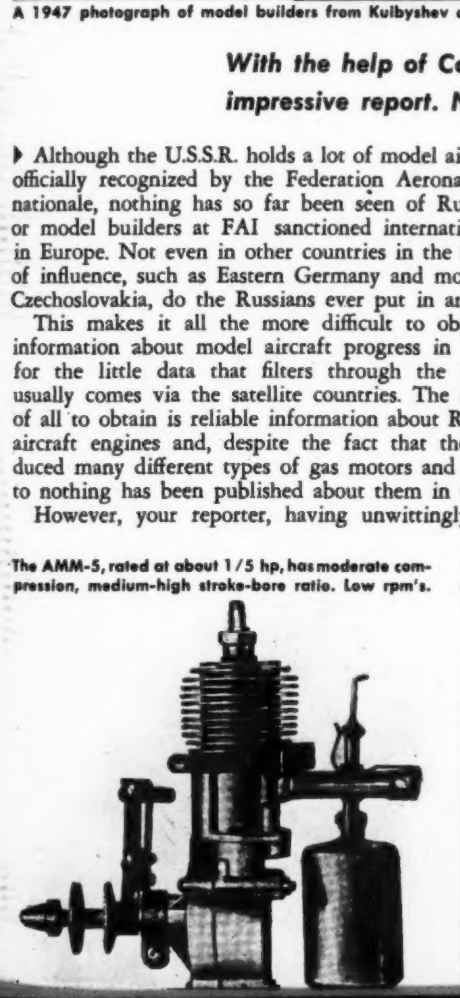
This makes it all the more difficult to obtain accurate information about model aircraft progress in Russia itself, for the little data that filters through the Iron Curtain usually comes via the satellite countries. The most difficult of all to obtain is reliable information about Russian model aircraft engines and, despite the fact that they have produced many different types of gas motors and Diesels, next to nothing has been published about them in the West.

However, your reporter, having unwittingly acquired a reputation as a sort of world-wide clearing house for model engine data, has been able to gather together a useful amount of information on engines produced in the U.S.S.R. For help in this we have to thank our various "spies" scattered about Continental Europe, at least one of whom considers it expedient (melodramatic as this may seem) to ask to remain anonymous rather than run any risk of being mistakenly identified with the wrong sort of politics.

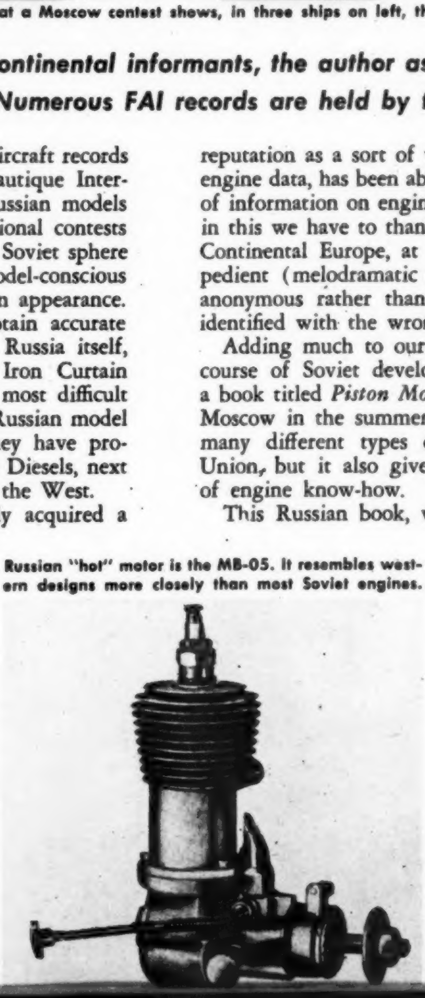
Adding much to our previous sketchy knowledge of the course of Soviet development in model engine matters is a book titled *Piston Motors for Flying Models,* published in Moscow in the summer of 1951. Not only does this detail many different types of motors produced in the Soviet Union, but it also gives an insight into Russian standards of engine know-how.

This Russian book, whose author, A. V. Filippchev, has

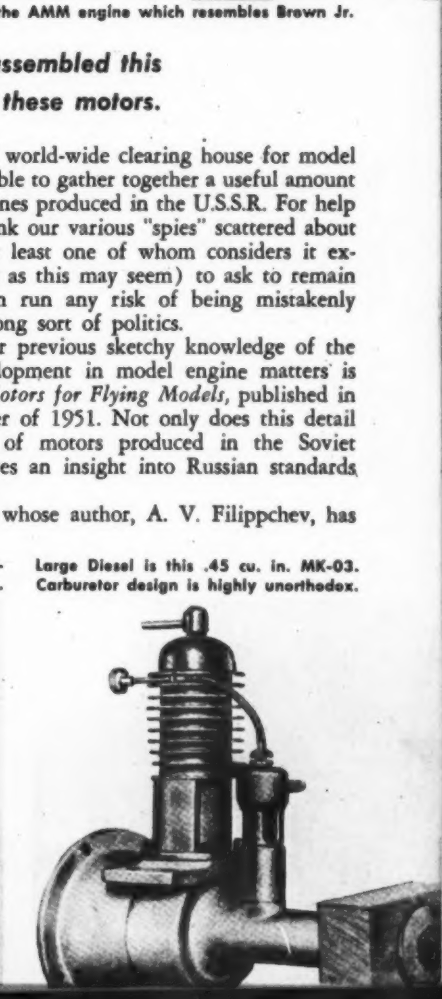
The AMM-5, rated at about 1/5 hp, has moderate compression, medium-high stroke-bore ratio. Low rpm's.

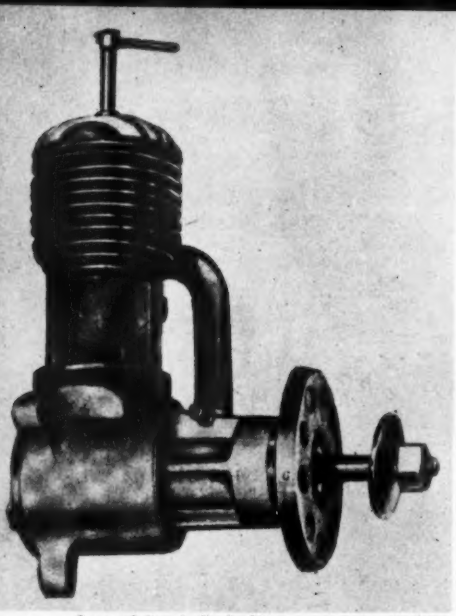


Russian "hot" motor is the MB-05. It resembles western designs more closely than most Soviet engines.

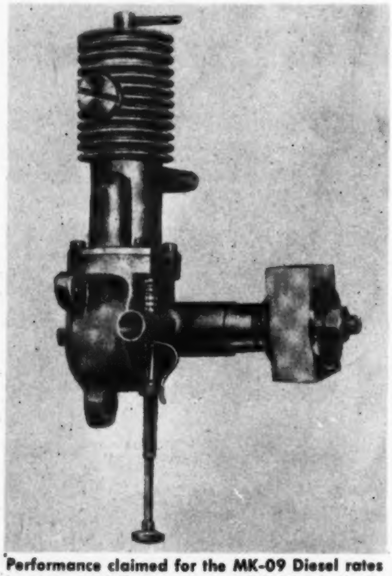


Large Diesel is this .45 cu. in. MK-03. Carburetor design is highly unorthodox.



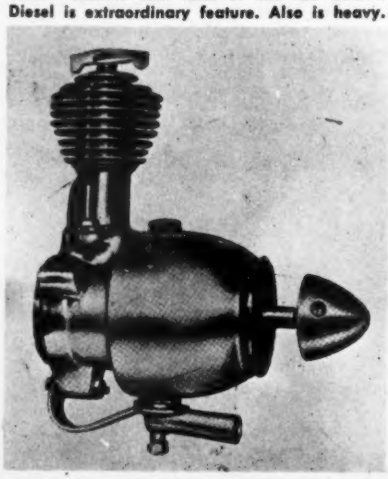


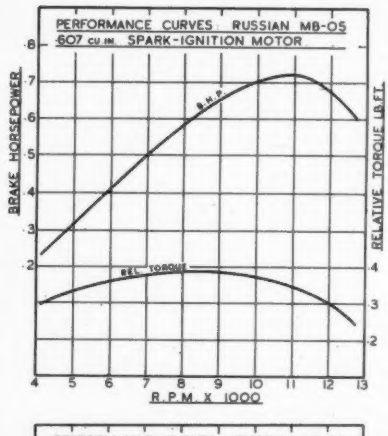
Somewhat spindly looking compression ignition engine is the .27 MKB-01, with side air intake.

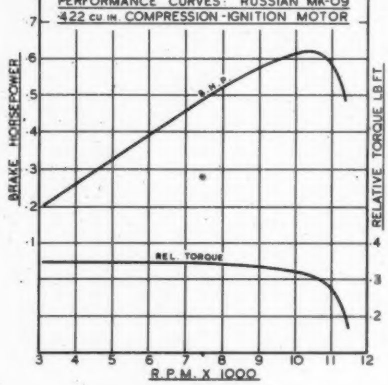


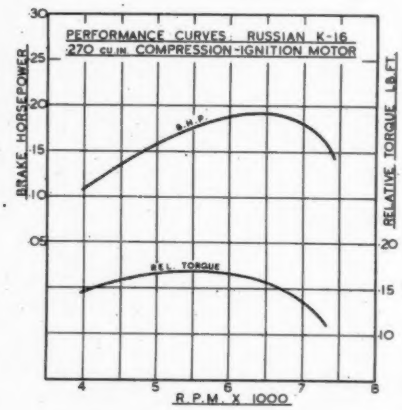
Performance claimed for the MK-09 Diesel rates it as one of the most powerful Diesels built.

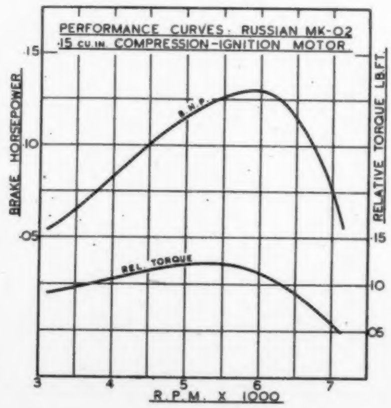
Below—Built-in fuel tank of the .26 KMK-1 Diesel is extraordinary feature. Also is heavy.











Typical glow-plug is bulky when it is compared with an American plug.

a number of engine designs to his credit, deals fairly comprehensively with model motor design and construction. All the various component parts are covered in turn, from which it is interesting to compare Russian methods with those adopted by the U.S.A., Great Britain and other Western countries.

It appears that Russian model builders have yet to learn the true worth of modern designs, as exemplified by current American glow plug engines and British high-speed Diesels. To us, all their designs look decidedly out of date and a survey of their specifications and performances confirms that this is so. In one respect this is surprising because there is nothing to stop the Russians from building a "McCoyovitch" or "Torpedoski" — they made a pretty good job of copying the B-29 and even if a Dooling powered model is unlikely to make a forced landing in Russian territory, there are always the diplomatic service channels by which all the prototypes could be obtained and shipped from London, New York, or any of a dozen other cities of the Western world. Of course, the Kremlin's representatives in these places are unlikely to be officially entrusted with such relatively trivial missions, but we think it highly improbable that a few American engines have not, by some means, found their way into the land of the hammer and sickle.

However, it is said that necessity is the mother of invention and, while this may explain Russian progress in military aviation, it is our guess that, model development being on a generally lower scale than in the West, the need for the Soviet Union to develop high-performance model motors has not yet arisen. It must be remembered that, despite a population as large as that of the U.S.A. and the British Isles combined, the number of people actively interested in gas models in the U.S.S.R. is undoubtedly quite small. This, of course, is bound up with the generally lower standard of living. As a result, the modern volume production methods of our two countries, which have made high-quality, high-performance engines possible at a price within the reach of almost anyone, have no counterpart in Russia as far as models are concerned.

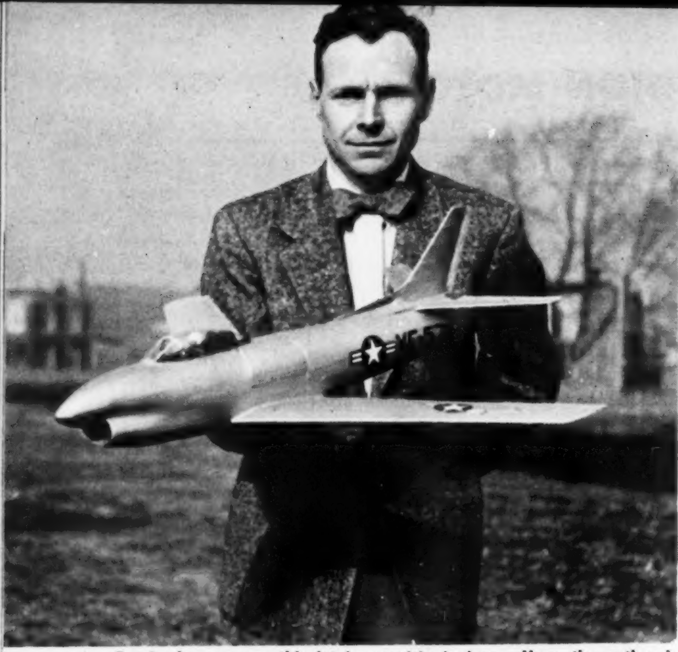
(*Continued on page* 48)

COMPRESSION-IGNITION MOTORS

Type	Displacement c.c.	Displacement cu. in.	Cylinder Bore & Stroke in.	Cylinder Bore & Stroke in.	Weight oz.	S/B Ratio (to 1)	Performance b.h.p.	at	r.p.m.	Induction System	Mounting
F-15	.4016	.0245	.315	.315	1.02	1.000	—	—	—	Three-port	Beam
MK-05	.9816	.0599	.3937	.4921	2.05	1.250	—	—	—	Three-port	—
MK-06	1.696	.1035	.4724	.5905	2.54	1.250	—	—	—	Three-port	Radial
TSAML-50	1.809	.1104	.4724	.6299	—	1.333	0.06	at	4,500	Three-port	Radial
MK-02	2.5	.15	—	—	—	—	0.13	at	6,000	Shaft valve	Beam
OK-20	3.04	.1855	.5905	.6693	7.05	1.133	0.12	at	5,000	Shaft valve	Radial
KMK-1	4.276	.2609	.6496	.7874	12.34	1.212	0.16	at	5,000	Shaft valve	Radial
MKB-01	4.4	.27	—	—	—	—	—	—	—	Shaft valve	Radial
AMM-12	4.423	.2699	.6299	.8661	7.0	1.375	—	—	—	Shaft valve	Beam
F-12	4.423	.2699	.6299	.8661	10.6	1.375	0.15	at	5,700	Three-port	Beam
K-16	4.423	.2699	.6299	.8661	9.8	1.375	0.19	at	6,500	Shaft valve	Beam
F-10	4.721	.2881	.6693	.8189	7.0	1.223	0.16	at	4,500	Three-port	Beam
MK-09	6.912	.4217	.7874	.8661	—	1.10	0.62	at	10,400	Shaft valve	Radial
MK-03	7.44	.4540	.7874	.9449	10.0	1.20	0.26	at	5,200	Shaft valve	Radial/Beam

GASOLINE MOTORS

Type	Displacement cu. in.	Displacement c.c.	Cylinder Bore & Stroke in.	Cylinder Bore & Stroke in.	Weight oz.	Comp. Ratio (to 1)	S/B Ratio (to 1)	Performance b.h.p.	at	r.p.m.	Induction System	Mounting
F-3	2.001	.1221	.5512	.5118	2.54	7.0	0.929	0.10	at	7,500	Disk valve	Beam
MB-01	2.001	.1221	.5512	.5118	2.63	—	0.929	0.10	—	—	Shaft valve	Beam
MZ-2	4.58	.2795	.7087	.7087	5.19	—	1.000	0.11	at	4,500	Shaft valve	Radial
MB-03	5.089	.3105	.7087	.7874	5.19	—	1.111	0.16	—	—	Shaft valve	Beam
F-5	5.103	.3114	.7480	.7087	7.05	5.0	0.947	0.14	at	4,500	Disk valve	Beam
"Komar"	5.103	.3114	.7480	.7087	—	5.0	0.947	0.10	at	4,500	Disk valve	Beam
AMM-4	9.12	.5565	.8661	.9449	—	—	1.091	0.20	at	4,500	Three-port	Beam
K-10	9.12	.5565	.8661	.9449	—	6.5	1.091	0.25	at	6,000	Three-port	—
AMM-5	9.503	.5799	.8661	.9842	10.6	—	1.136	0.15	at	5,000	Three-port	Beam
AMM-1	9.833	.6000	.8740	1.000	—	4.0	1.144	0.22	at	5,000	Three-port	Beam
F-4	9.95	.6072	.9449	.8661	—	7.0	0.917	0.30	at	6,300	Disk valve	Beam
"Schmel"	9.95	.6072	.9449	.8661	10.6	7.0	0.917	0.30	at	6,300	Disk valve	Beam
MB-05	9.956	.6075	.9067	.9409	—	8.2	1.037	0.72	at	11,000	Shaft valve	Beam
MB-02	9.971	.6085	.9055	.9449	—	—	1.043	0.40	at	6,600	Shaft valve	Beam

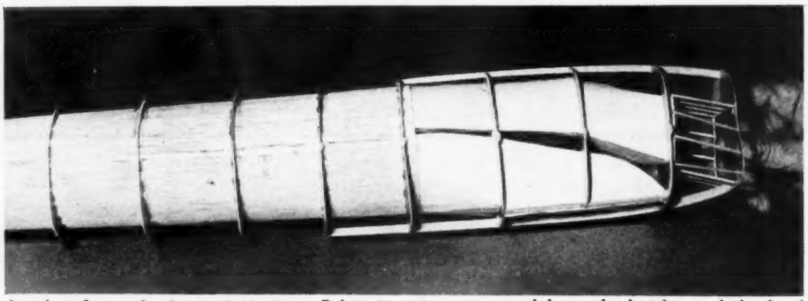


For its low power, this jet is surprisingly large. Here, the author is holding the Sabre to show its relative size. Note the helmeted pilot.

With fan blades twisted to proper angle (30 degrees) the engine turns 15,000 rpm. Bottle cap on shaft behind fan is used for pull-cord starts.

The Sabre

by THOMAS H. PURCELL, JR.



Jet duct forms the internal structure. Points to note: upper and lower keel strips and the bond paper ducting to the nose and underside air inlets. Slight torque effects not a problem to adjust.

After fairly fast hand launch, the Sabre climbs steadily. Scale speed of the model is 550 mph.

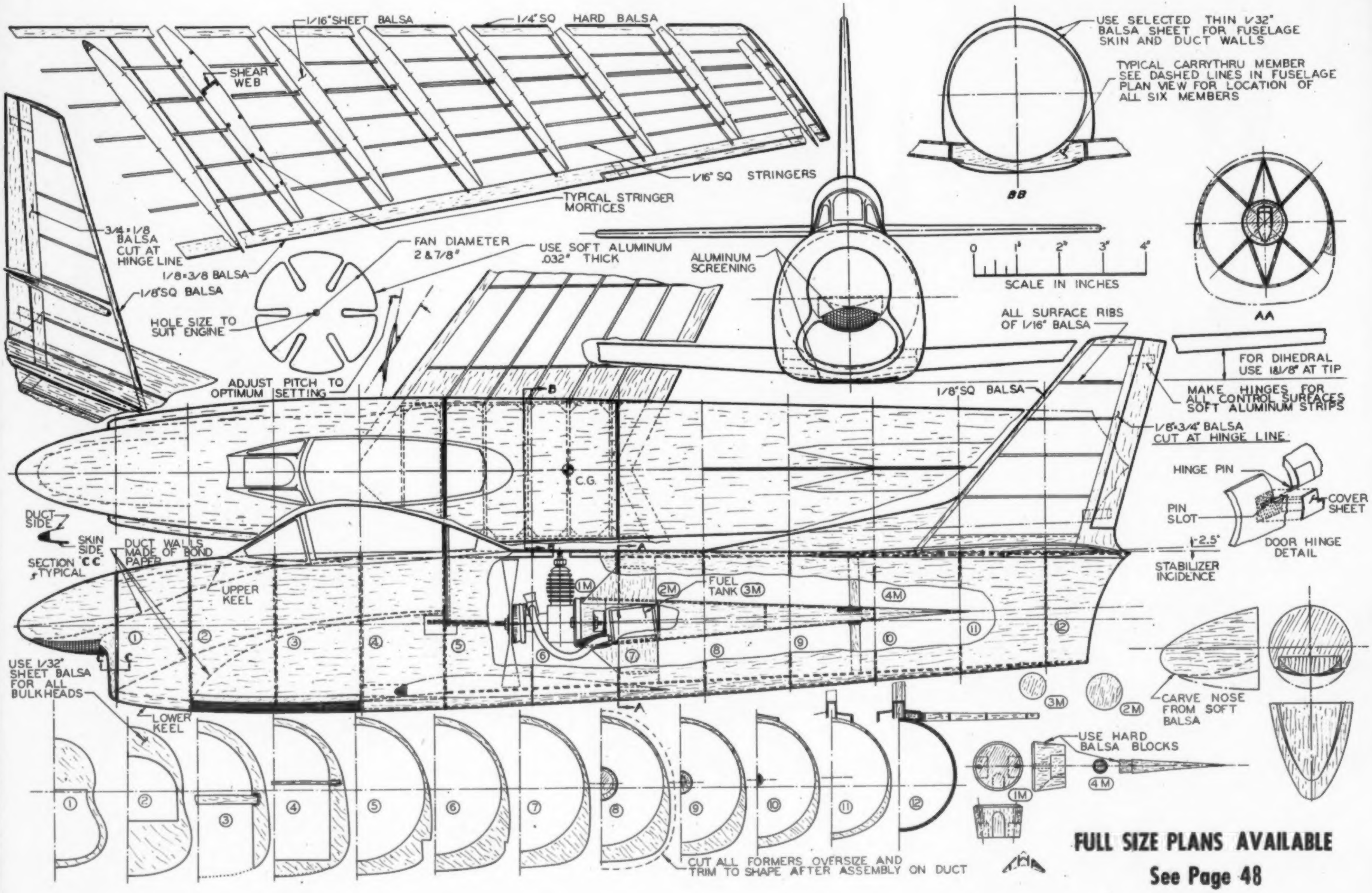
The man who first proved that scale jet jobs can be flown with ordinary engines, details construction of his successful F-86D for Half-A engines.

▸ The F-86-D was chosen for the ducted fan power system because its parameters best favor stability in flight. One unusual development was that the full scale prototype set a world speed record after the model had been completed. This phenomenon is probably unique in the history of model aviation.

The model flies very realistically and is easily controlled by the tab settings. It weighs 6 oz. and has a static thrust of 3 oz. This 50 per cent thrust to weight ratio is probably better than that of the full scale Sabre. The scale ratio is 15.8 to 1. The full scale Sabre flew almost 700 mph. Thus, if the model should fly 44 mph, it would move as many plane lengths per hour as the prototype. The flight speed of the model has not been measured; but in normal sport flying the model appears to be going about 35 mph. This compares with 550 mph full scale, which is a good cruising speed for such an aircraft.

If trimmed for left circle, the model so flies regardless of power conditions. The low torque makes the model easy to trim for powered flight and greatly reduces the stability requirements as compared with conventional propeller-driven models.

The use of moderate dihedral was predicated on the need for some control over the well known tendency of models to spiral under power. A distinct advantage in a swept wing is variation of effective dihedral with lift. This means that, if the model tends to spiral, it is necessary only to trim the model for slower flight, which makes the wing operate at higher lift. This gives the airplane more effective dihedral and eliminates spiral tendency. The builder is warned *(Continued on page 44)*



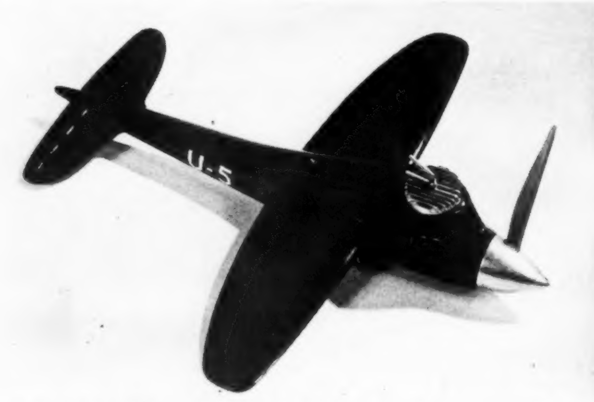
FULL SIZE PLANS AVAILABLE

See Page 48

Czechoslovakia's No. One modeler, Zdenek Husicka, held four FAI records, has dozens of wins to credit.

Husicka's Letmo-powered jet is holder of the absolute world's speed record. It once turned 178.978 mph. Metric conversion to inches indicates span is but 11.8 in., length is double that.

His Letmo Diesel powered speed job (about 14 cu. in.) exceeded previous international record by 65.32 mph. Span is 12.59 in., length is 14.56.

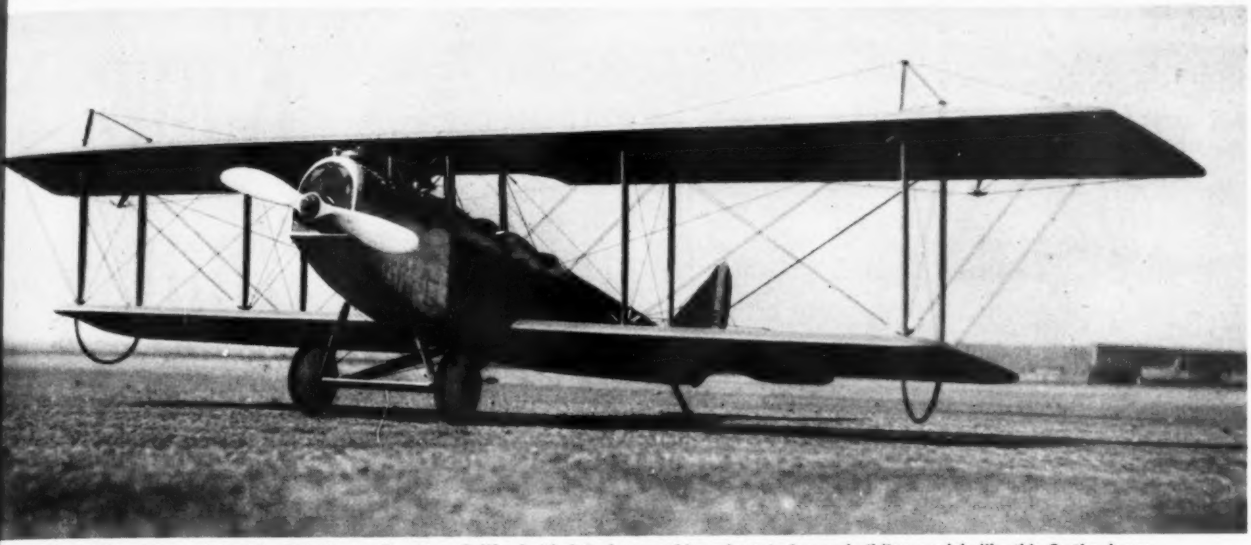


Holder of two FAI speed records, Husicka's Letmo Diesel-powered U-5, has hit 102.15 mph at Czech Nationals. Note one-bladed, laminated propeller.

Air Ways . . . Anything you'd like to see? MAN readers oblige!

Over 100 flights without a crack-up were made with this six-foot, four-pound modified Flamingo boat built by Bud Caddell, Jacksonville, Fla.

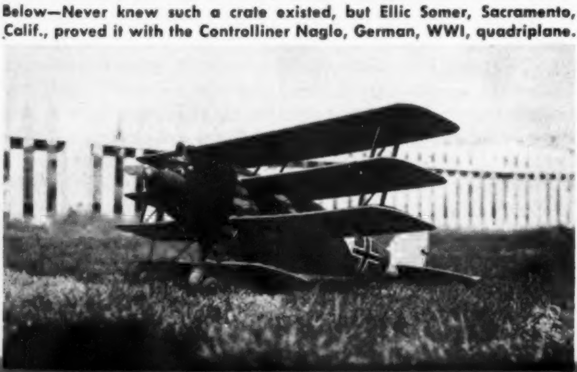
Tommy White, Elko, Nevada, made this Pelican flying boat from plans in Dec., '52 MAN. Powered by a Spitzy .045, it is stable and has good glide.



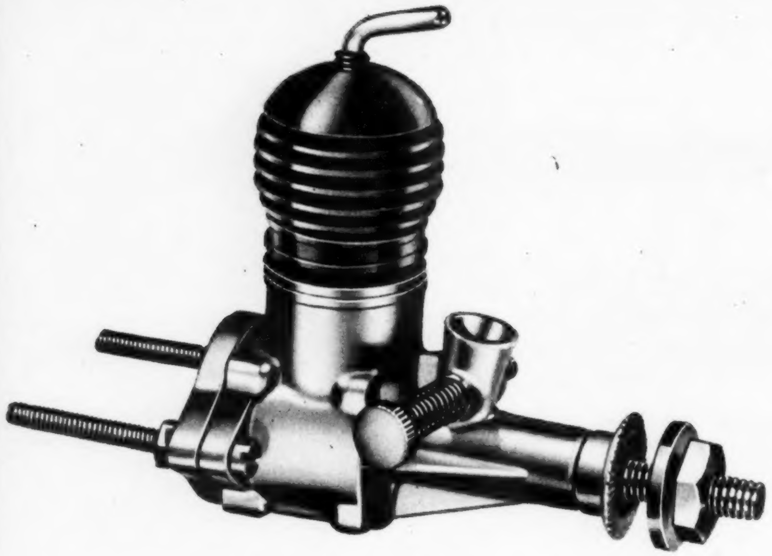
A World War I fan all his life, Dick Kemp, Compton, Calif., decided to do something about it, began building models like this Curtiss Jenny.

In 1-1/4 in. scale, Kemp's Jenny is silk covered. Wings are yellow and the fuselage is olive drab; struts and cowl are gray. A Torpedo .32.

When William Esposito of Woodside, N. Y. went overseas in the Air Force, he sent home for a kit. This nifty Curtiss Navy Hawk was the result. Below—Never knew such a crate existed, but Ellic Somer, Sacramento, Calif., proved it with the Controlliner Naglo, German, WWI, quadriplane.



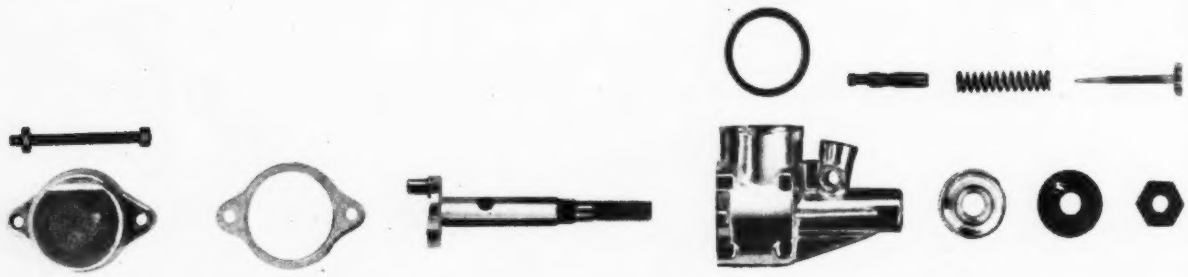
Help! Get it off! Ducted fan builder Ray Malmstrom, Cambridge, England, seems to have bitten off more than his plane can chew. It spans 22 in.



Above—The McCoy Duroglow .049 Diesel, first modern American Diesel. To the right, and below, the engine is shown disassembled. Compression is variable.

Know Your Diesels

by E. C. MARTIN



Once familiar with the compression ignition engine, you'll find it as easy to start and operate as any other. From fuels to adjusting, the complete dope is here.

One of the many advantages of the modern Diesel is its ready adaptability to varying conditions of load and speed. The glow plug engine, however, is most efficient only over a small range of speed as dictated by the various factors governing its operating temperature: fuel, plug, and compression ratio.

The operating efficiency of the Diesel is also controlled by its heat set-up, but as ignition is achieved entirely by compressing the mixture to the point where spontaneous combustion occurs, compression and fuel are the only variables one has to consider, and since most Diesels now feature adjustable compression, the field of simple tuning is confined to only one factor—fuel. Furthermore, the Diesel is not, as commonly believed, fussy about fuels. Almost any oil, if mixed with ether, will make it run.

However, for easy starting and maximum performance, it is like any other engine in responding best to selective treatment, and a few words about fuels and handling may save the new Dieseleer many a sore finger.

A golden rule is always to flip a Diesel hard, really hard. It is in the fickle nature of the breed to fire when you least expect it, and the high pressure brings the prop round painfully fast. Most of the starting difficulties attributed to Diesels are really caused by operators who don't flip hard enough. Bear in mind that all the heat required to make the mixture fire comes from compression, and therefore the faster you flip, the greater the quantity of heat generated.

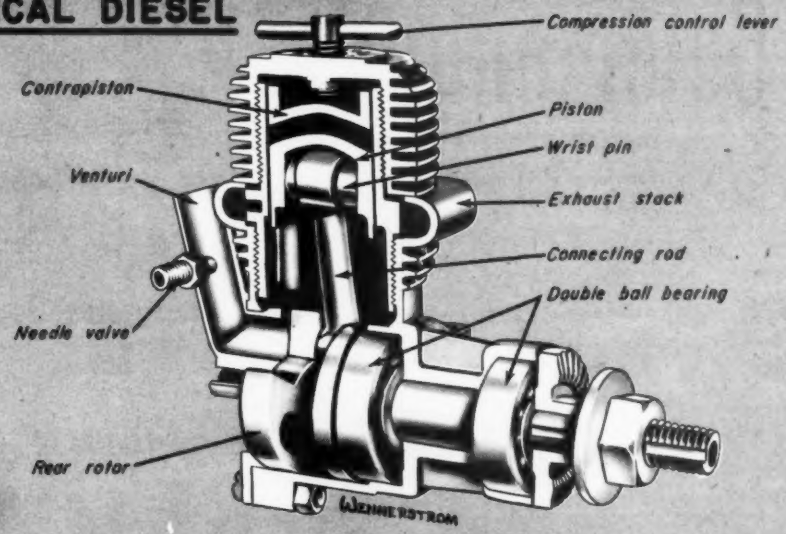
A second consideration is firm mounting. Apart from the power absorbed by vibration, there is considerable danger of a Diesel, particularly a larger one, suddenly tearing out of its mountings, should the mounting bolts vibrate loose, and damaging both itself and the operator.

Fuel tank design and location requirements are similar to those of a glow plug engine, but the Diesel again shows an advantage in that carburetion and needle valve settings are less critical. This greater latitude in mixture strength is particularly welcome in stunt flying where engine speed and fuel level are subject to continual variation.

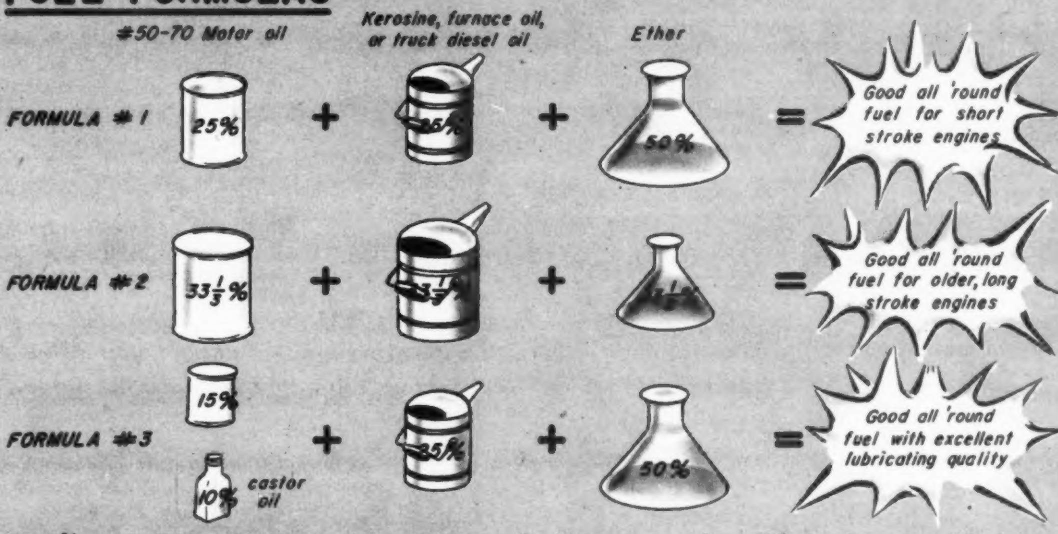
For those who indulge in long sessions of pleasure flying and are more interested in economical operation than ultimate power output, the Diesel offers a substantial savings in running costs, particularly if you care to mix your own fuel. A very good mixture from all points of view consists of 25 per cent No. 50—No. 70 motor oil, 25 per cent truck Diesel oil, kerosine or domestic furnace oil, and 50 per cent ether. This fuel is well suited to short stroke engines. For older, long stroke types, the ether may be reduced and the ingredients mixed in equal parts. However, although the ether content is the most costly part of the fuel, it is false economy to use too little, as starting becomes more difficult, and compression settings higher, causing increased engine wear and rough running with poor performance.

This fuel will add much to power and smooth running with the addition of 2 per cent amyl nitrate. Compression

TYPICAL DIESEL



FUEL FORMULAS



2% amyl nitrate added to the above fuels permits lower compression settings, with less critical needle valve settings!

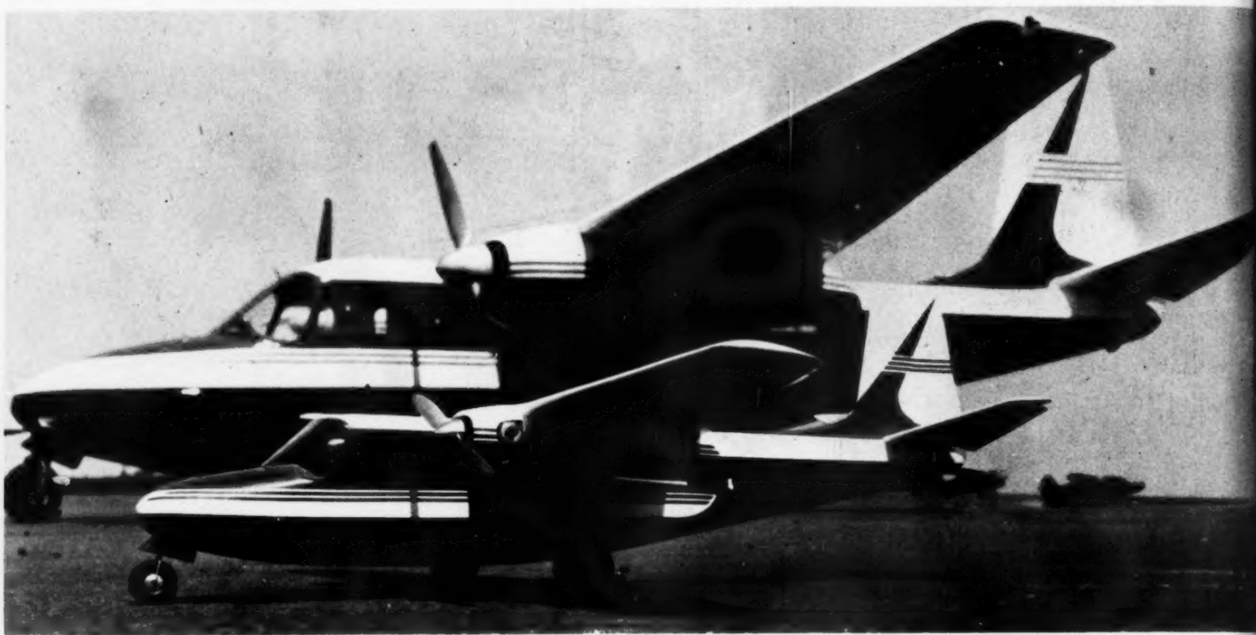
settings will be lower and needle adjustments even less critical. With high compression settings which give maximum power in level flight, a Diesel tends to load up when running at reduced speed in tight maneuvers. Amyl nitrate minimizes this annoyance by permitting a richer needle adjustment and lower compression settings. This nitrate content should not exceed 2 per cent, however, as it appears to reduce the lubricating efficiency of the fuel and causes overheating. And it's also very expensive.

When starting from cold with a nitrated fuel, it is usually necessary to use a higher compression setting than regular fuel demands, but once the engine is warm, the optimum compression will be found to be well below that normally required.

A substitute for 2 per cent amyl nitrate is 1 per cent amyl nitrate, but although it is cheaper and often gives better performance, it is not so kind to the engine. A mixture of these two ingredients will produce the highest power in some motors, and a little experiment in this direction is necessary to arrive at the best compromise for each individual engine, as friction is present in varying amounts in all engines, even those of the same make and design. This applies to normal fuels for normal engines and is generally adequate for all types of flying, including competition, and will be found to meet the requirements of most modelers.

However, there are many other ingredients to intrigue the jungle juice enthusiasts and before discussing them, an explanation of the function of each fuel component will enable a better appreciation of their virtues. Among these, lubrication ranks high. Reduction of friction is one of the keys to performance, and the more power you build into a fuel, the better must be the lubrication to offset the increased bearing loads in the engine. When running efficiently, a Diesel burns and extracts power from much of the lubricating medium, whereas most glow engines throw it out with the exhaust. This results *(Continued on page 40)*

Aero Commander



Except for the barely visible head of one of the Cub 14's, the model is dead ringer for the big ship from which it was copied at the airport.

Factory data plans contributed to the amazing authenticity of the 55-inch model. Its total weight is only 51 oz., compared with the usual five-pound twins.

Gather round, you twin-engine fans. Here's a ship that is scale, light, real flier. For the .14, it takes new .15's.

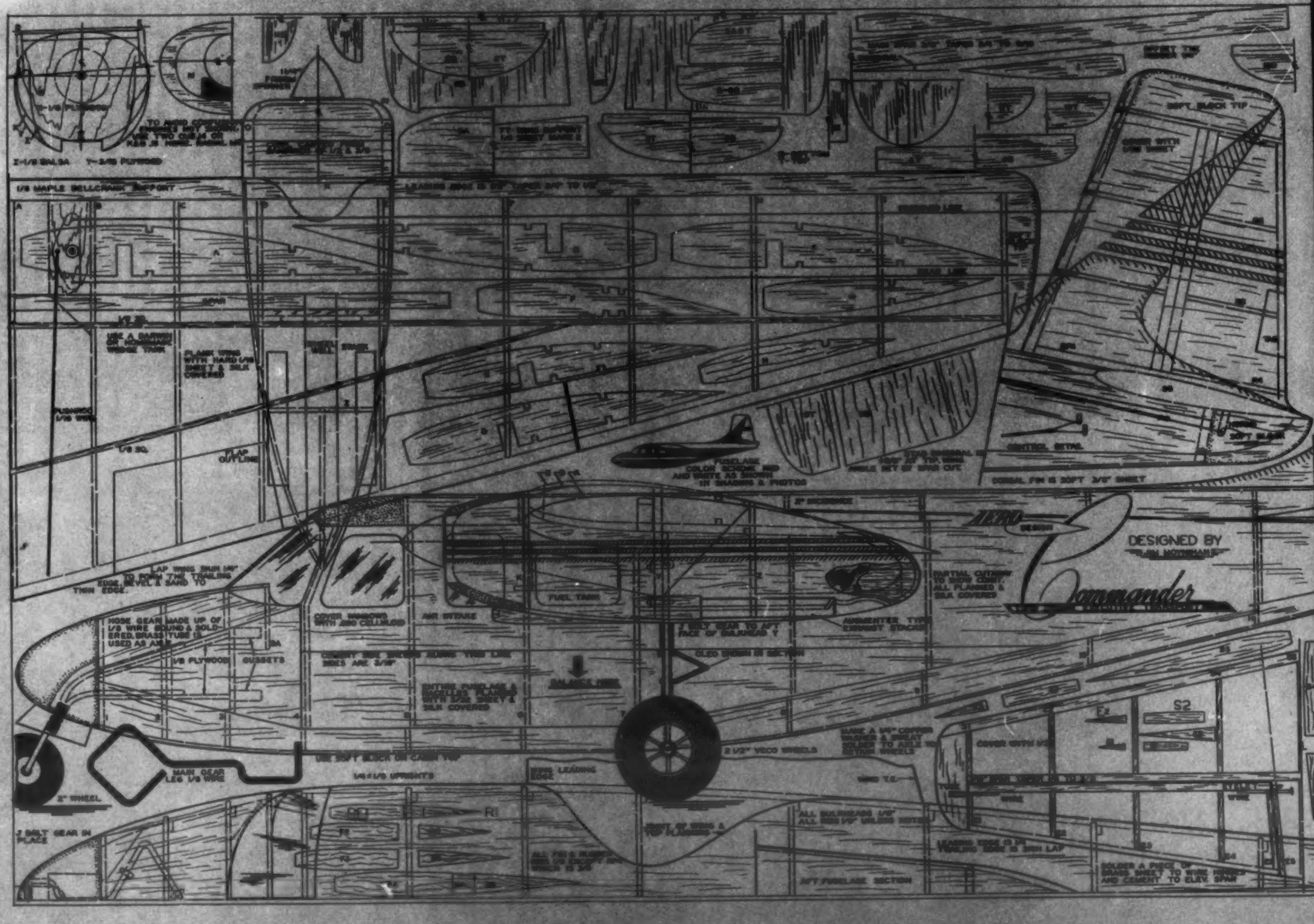
Below—A red-and-white color scheme, with red striping and lettering, dresses up the ship. MAN cover artist Jo Kotula designed color scheme for the real plane.

BY JIM MOYNIHAN

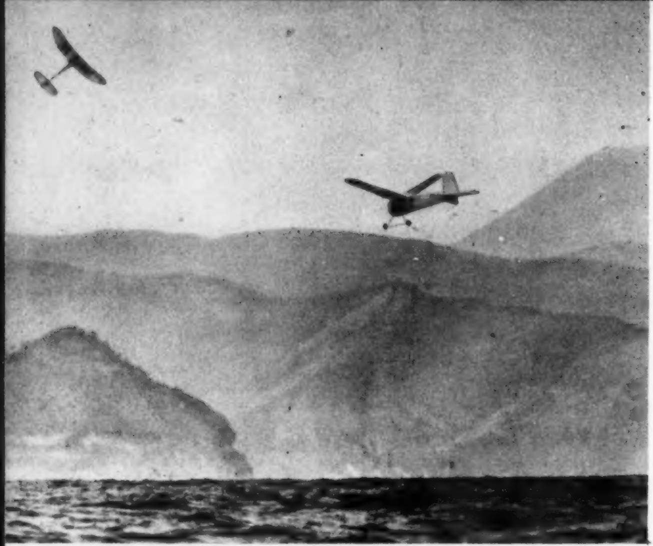
▶ This twin was designed expressly for executive transport use, highlighting the growing demand by America's businessmen for a ship to meet their specific needs. With a performance ratio of 5 to 1, high speed 211 mph, stall at 40 mph with power on, it is one of the most efficient airplanes in this country. Powered by two geared 260 hp Lycomings, it cruises at 197 mph, climbs 1,700 ft. per minute. Carrying five or six passengers with optional seating arrangements, the span of the Commander is 43 ft. 10 in., overall length, 34 ft. 1/2 in. and the height, 12 ft. 10 in. The author was fortunate enough to get in a flight in the ship shown in the photographs and can vouch for the wonderful flight characteristics of the prototype. Many thanks are due genial Doc Marsden and Bill Wheeler of Buffalo Aeronautical Corp., local Aero distributors, for their help and cooperation.

The photos will vouch for the fidelity to scale in the model. The plans were drawn from factory data and frequent visits to the airport, although the model is no even multiple scale of the original. It came out to about 53 in. wingspan, but more important, around 400 sq. in. of area, the main goal. We did not want a heavy high-powered ship, so we designed for a weight of 48 oz. ready to fly and decided on the Cub .14's for power, although the K & B 15's would also work out well. Total weight actually came to 51 oz., including 4 oz. of nose ballast. Construction has been altered slightly since then, so you should come out okay without the need for ballast. Our wing loading then is about 18 oz. per sq. ft., contrasting with the average five-pound scale twins at 36 oz. and up. The low loading means real flying on the wings, less pounding of the landing gear and less need for high power. Convinced?

(*Continued on page* 52)

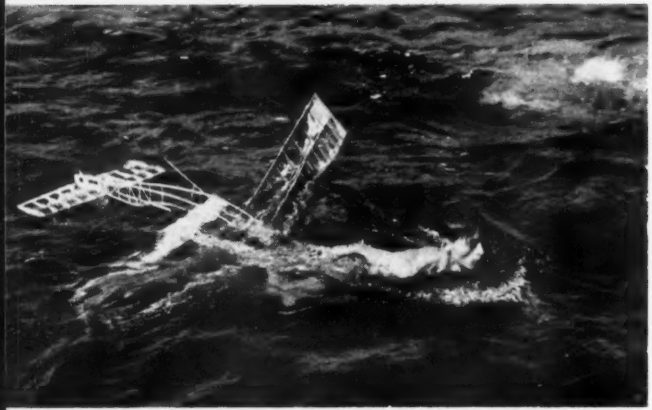


FULL SIZE PLANS FOR BOTH "SABRE" AND "AERO COMMANDER" AVAILABLE. SEE PAGE 48.



Heading for the mainland six miles away are these entries in the annual Hatsu Island-Ito city contest. Mt. Fugi, right, is over 100 miles away.

One of the luckier entrants in the over-water contest—he got back his plane! Many ships are lost in the ocean despite stand-by rescue launch.



The winner—or what was left of it! Planes must land within a one-mile radius of the town of Ito, which makes it difficult for models to place.

A host of friends from Japanese model aviation circles honored Mr. Dallas Sherman on "Sherman Day." No question of the model plane's identity.

JAPANESE MODELING

▼

BY TOM PROBST

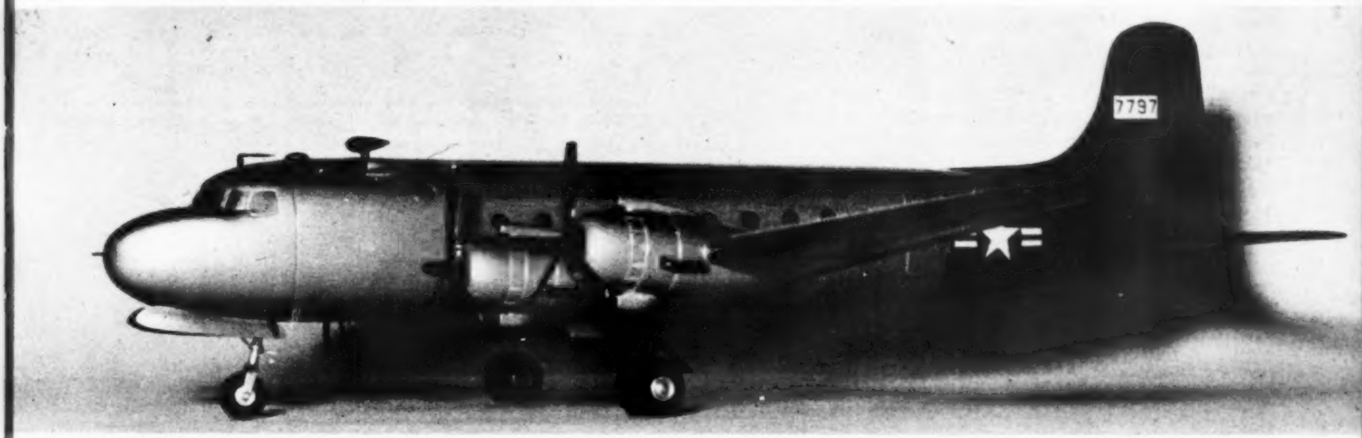
Most popular hobby in Nippon, the building and flying of model aircraft has had a fantastic growth. Newspapers maintain special press departments and ten magazines cater to hobbyists.

▶ Japenese model airplane enthusiasts, though faced with many obstacles, have made their hobby "ichiban" (number one) in the land. And despite the wide differences between American and Japanese practices, it's amazing how similar model building is in the two countries.

Though most department stores in Japan have model-craft sections, hobby shops as such are rare. In Tokyo, the mecca for hobbyists is Tenshodo's, just off the Ginza—Japan's "main drag." Here the model fan will find gas engines, scale and stunt controlliners, kits and ready-built planes. Free flight models are offered, along with a limited supply of dope, lines, plugs, and accessories. From Tenshodo's own factory come finished controlliners in wood and silk, aluminum and bamboo. Their beautifully detailed solids are hand-rubbed to a gleaming finish.

Since American kits are not readily available because of the high tariff, Japanese kits follow American lines closely. Kits contain little or no balsa—expensive and scarce in Japan. Instead, parts are pre-cut and pre-shaped from cypress

For $25 the Japanese hobbyist can buy a completed controlline model like this B-26, while a single-engine scale job brings $10. The gorgeous B-29, right, above, cost $100 ready to fly. Kits range in cost from $3 to $4.50 for Class B or C one-engined jobs, to $7.50 for the scale twins.



Many service pilots buy one-quarter inch scale solids from Tenshodo's department store—this C-54, for example. Glossy lacquer, hand rubbed.

wood. Wings are usually of rib-and-spar construction with sheet tail surfaces. The body is crutch-and-former, often planked with thin sheet soft pine.

Kit prices range from $3 to $4.50 for single-engine Class B and C controlliners. Smaller fighter planes are about $2. Kits for twin-engine planes—like the DC-3 and B-26—run around $7.50. Carefully made finished craft cost about $10 for single-engine models and $25 for twin-engine craft; and one custom-built model of the B-29—including four gas engines—cost the proud owner $100. A flying-scale Cessna made entirely of aluminum is in the neighborhood of $20.

Motors also reflect the American influence. Made in all sizes from half-A to D, the prices go from $2.50 to $7. Either standard or glow plug ignition may be had.

Faced as they are with difficulties getting kits and supplies, it's surprising how many Japanese are enthusiastic modelers. And once the modeling bug bites them, most continue making planes through their adult years. One of the best known modelers in Japan is over 50 and still has startling, original designs flying off his workbench.

Reflecting this interest is the number of magazines published for model makers. There are approximately 10 different ones, most issued monthly. There are many magazines and books about aircraft in general with regular departments devoted to model building. (*Continued on page* 41)

Below—A finished Lockheed P-80 fighter by Tenshodo. Such airlines as Northwest, BOAC, and PAL, have models of their new giants built to order.

Below—Even exciting military types, like this Vought Cutlass, can be purchased. Japan's many hobbyists use American AMA rules for competition.

In addition, leading Japanese newspapers have editorial sections devoted to miniature aircraft. The "Asahi Shimbun" (Rising Sun Newspaper) and the "Mainichi" (Every Day), for example, with a combined circulation of better than ten million copies daily, have complete press departments devoted to flying and modelcraft.

The history of Japanese model building goes back before the first World War. Crude copies of the crude aircraft of the day, many of these early models flew surprisingly well. The war gave Japanese model building a boost and the hobby grew rapidly after 1918. The first all-Japan model contest was sponsored by the "Mainichi" in 1923 and became an annual event.

Models were usually made of bamboo or celluloid, covered with silk or rice paper, and either doped or lacquered. Few balsa models were built because of their cost. Accessories, such as scale motors, lights, and celluloid products, were extremely well detailed.

By 1940 the most popular planes were rubber-powered, with a sprinkling of gas free-flight. One or two G-line models had been constructed, but the war stopped further development along this line. The rubber-powered craft were both flying-scale and Wakefield types. Gas engines, mostly imported from America, were rare and expensive.

As in the United States, Japanese modelers were plagued with some shortages during the second World War. Japanese model aviation got a tremendous lift when the wartime government made model building compulsory in high schools. Pre-flight courses were also inaugurated. Like members of the U. S. armed forces, Japanese servicemen took time out from the war to make models. One memorable picture shows a Japanese soldier in Java whittling parts for a glider, his rifle nearby.

At the end of the war, Japanese model activity was stopped by U. S. occupation authorities. In 1946 famed author Komatsu Kitamura appealed to American headquarters and had the ban lifted, and that year the first Japanese-American model club was started by a GI. From a beginning of 50 members, the International Model Club zoomed to more than 300 in less than a year. In three years this organization conducted nine Japan-wide contests. At the start of the Korean war in 1950, the club disbanded because many American members were sent to Korea or rotated home.

In place of the IMC the Model Airplane Federation of Japan was formed, patterned after the Academy of Model Aeronautics. Member clubs in each of Japan's 18 prefectures (states) now total over 4,500. Dues run about 85¢ (300 yen) a year.

AMA rules are followed for contests. In addition to the regular classes, the Japanese have added two others for covering planes made of bamboo and rice paper. One of the most interesting contests is held each autumn on Hatsu Island, south of the Tokyo-Yokohama area. Planes are launched from the island to fly to the coast of Japan, six miles away. They must land in a prescribed area near the city of Ito. For each model which makes the shore, many, many are lost at sea.

Exhibitions of models draw huge crowds. More than 50,000 spectators jammed Mitsukoshi, Japan's foremost department store, to see a recent assortment of models. Individuals, both Japanese and American, have done much to boost model aviation. Mr. Kazuo Asami, chief secretary of the Model Airplane Federation of Japan and flight editor of the "Mainichi," works hard behind the scenes in contests and activities. Mr. Riichi Azuma, who retails many Japanese-made models to the U. S. security forces, is another enthusiast. Men like these in America as well as in Japan are the unsung heroes who do much so others may have far greater enjoyment.

Perhaps the best-known model maker is Mr. Komatsu Kitamura, dean of Japan modelers. A well-known author, correspondent, and playwright, Kitamura began building planes after the Bleriot (*Continued on page* 41)

Republic Thunderjet reveals a willingness to make models the hard way. Note that most of these photographs show the landing gear extended.

Front quarter view of the C-54, also shown on page 23, indicates exceptional finish, as suggested by reflections cast on its shining surfaces.

The famous—or infamous?—Mig 15. In addition to authentic landing gear struts, details include wheel cover doors, machine guns, antenna.

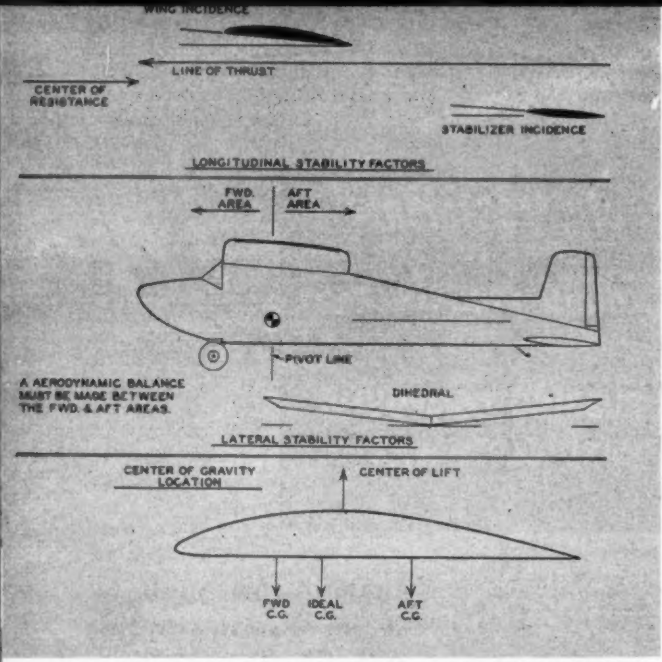
A widely known transport in the Orient is the Curtiss C-46 here duplicated in all its resplendent colors. Model engines cost from $2.50 to $7.

North American P-51H Mustang solid has accurately scaled canopy and a four-bladed propeller. Hatch, canopy, and control outlines are scribed.

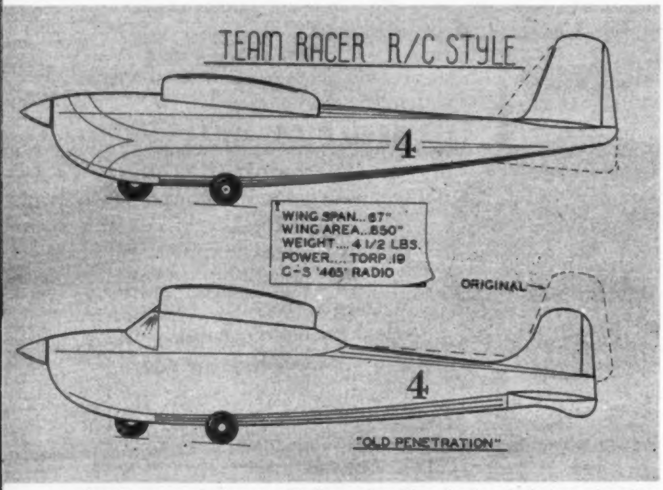
Some R. C. EXPERIMENTS

The fascinating story of what happened when a speed-stunt controlline flier tried out his ideas in the field of remote control airplane design.

by HAROLD deBOLT

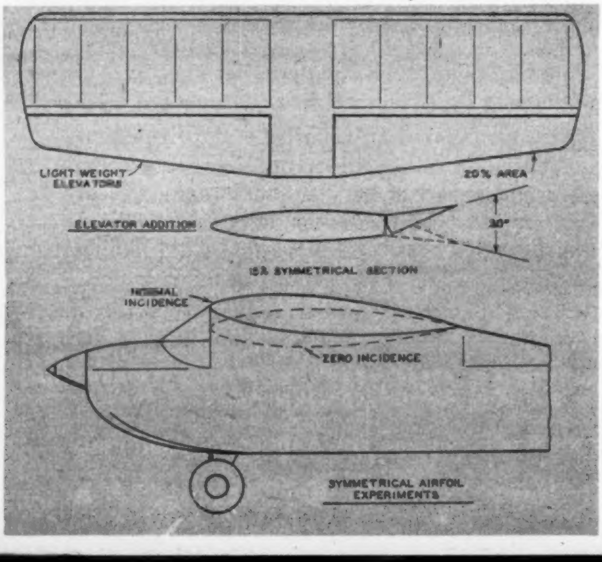


Basic set-up which was the jumping off point for the later experiments.



Despite several changes, TR flopped until revised as in bottom drawing.

Below—LW Sr. elevators and, bottom, symmetrical airfoil experiment.



With over 1,000 flights in final form, No. 4 had more area than Live Wire for slower performance but crossed up designer by flying much faster.

▸ My first RC model, one of the most popular designs of the day, pointed the way to many improvements.

It seemed to me that the plane could be made to perform equally well in wind or calm, and that it could be made to fly much more realistically. Also, there should be some way for the dub to service radio equipment more easily. To allow this, the ship should be reasonably small for easy transportation, and simple to build and maintain. A .19 powered model seemed about right for size and would have power to penetrate any reasonable wind. Use of a removable radio unit took care of service and simplicity, and only the problem of flight remained. But there, the going really got tough.

At first, it seemed impossible to duplicate the flight of a full scale machine with a model which has only rudder for control. However, we did know that the way a model is laid out can affect its flight strongly. The problem was to design controlling factors into the plane which, when in flight, would substitute for the additional controls of a full scale machine.

In full scale, controls are used in combinations; for turns you use rudder, ailerons and elevators to get smooth changes of direction. In the model, we must have design factors to duplicate each of these, but such built-in controls could not be coordinated when exploited to their fullest individual

Symmetrical sectioned shoulder wing No. 3, a bad flier, led to early No. 4, the second ship in line. Now controllable, it in turn yielded to the cabinized version shown on opposite page. Forward placing of rear wheels gave improved take-offs, but two wheels proved better on rough runways.

Swank's low wing with symmetrical section, butterfly tail is fast and stable on Cub .14. Grosses three pounds and has 600 sq. in. of wing area. Supposed to have two channels: one for each elevator-rudder. This ship grew out of stunt experiments described—better for upside-down flying.

effect. Therefore, we had to determine the type of flight sought under all conditions and then blend these built-in controls to produce the desired flight characteristics. These devices must be built into the model, for seldom can they be added after it is completed without detracting from performance.

What are some of the factors that make for realism in flight? First, the model has to fly in a rather flat manner, having a low *angle* of climb. But also, it must have a fair *rate* of climb in order to gain altitude quickly. Applied to our model, this meant that the machine could not be a floater. A high forward speed plus a low climbing angle meant that it had to have exceptional longitudinal stability and that this stability had to be maintained over a wide speed range from full power to the glide. Longitudinal stability is controlled by three forces: wing and tail setttings, center of resistance, and thrust line location. The ability to maintain altitude or to lose it permanently is of paramount importance. This is best achieved by maneuvering the model, usually by various degrees of turning. Gradual turns hold a given altitude; sharper turns cause the nose to drop. Such flying requires a laterally stable model; that is, one which will fly in a turn without dropping its nose until the turn becomes relatively tight. Lateral stability is governed by the side areas of the model and its dihedral.

Another important requisite is that the model be capable of straight flight. Once put on a straight course, it should hold that course, both under power and in the glide. Also, wind should have little effect upon it; downwind or crosswind conditions should not affect straight flight. A good compromise must be made if the model is to fly straight and still be able to turn properly. The compromise is brought about by having the correct amount of side area both behind and ahead of the center of gravity; thus, the model balances areawise at the CG. Any rudder deflection will turn it readily, yet wind striking the side of the model will be equal on both sides of the pivot or CG.

The model must respond to control at all times — into the wind, crosswind, or downwind. Turns should be equal in size, both to the right and left, power on or off. Fortunately, this behavior is almost automatic in a model whose side area is in correct balance. Rudder response should be quick, not violent. This calls for careful choice of rudder size and movement. For simpler turning, the model should continue momentarily in a turn after the rudder has been applied and released — 90 to 180° is satisfactory. However, recovery at this point should be positive without the use of opposite control and, above all, it should not rock out of the turn. These two factors are controlled mostly by dihedral, and the proper amount will effect the (*Continued on page* 36)


TESTOCH


TESTORS "39"
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By every standard of comparison — easy starting, all-weather performance, power output, quality and quantity of lubrication — Testors "39" is the outstanding all-purpose fuel for all standard model engines. It was developed after many months of research; flight-tested and approved by experienced modelers under the most extreme conditions of stunt, contest, and just-for-fun flying. Try Testors "39" now. See for yourself what top powerformance really means!
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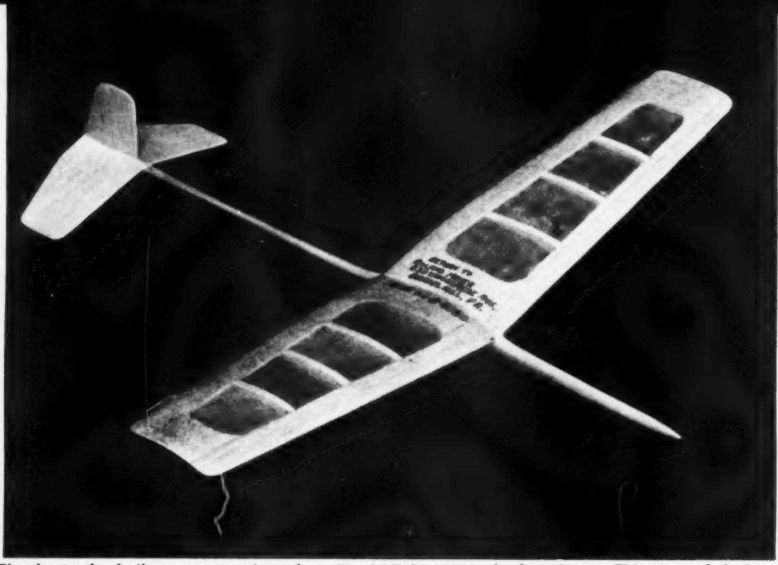
Gliding was undoubtedly the first form of flight adopted by man when he finally got over the idea that air travel was strictly for the birds; and although we were not present at the time, we would guess that the first model flying contest took place when a pair of medieval taxidermists got together to see how far they could throw a stuffed bird. Perhaps from such a humble beginning came our most hardy of all perennial contest types. There can be no doubt that the old hand launched glider is just that; for during the past 15 or 20 years of organized contest flying it has remained consistently popular, while many of the more spectacular events, after enjoying a brief fad, have disappeared from the contest bill of fare.

Strangely enough, although the hand launched glider has everything that should appeal to the novice, many of the younger flyers seem to prefer something larger, and by all means noisier, once they have progressed beyond the nickel glider stage. Perhaps they feel that this type of ship does not offer enough challenge to their new-found talents. If this be the case we would advise them only to take a good look around at their next free flight contest. They might be surprised to find many of the old timers throwing their arms out for the hardware in the glider event.

In this article we would like to present "Real Gone," a hand launched glider which we hope will appeal to beginner and experienced modeler alike. This is a high performance ship designed primarily for contest flying, and it is capable of (*Continued on page* 36)

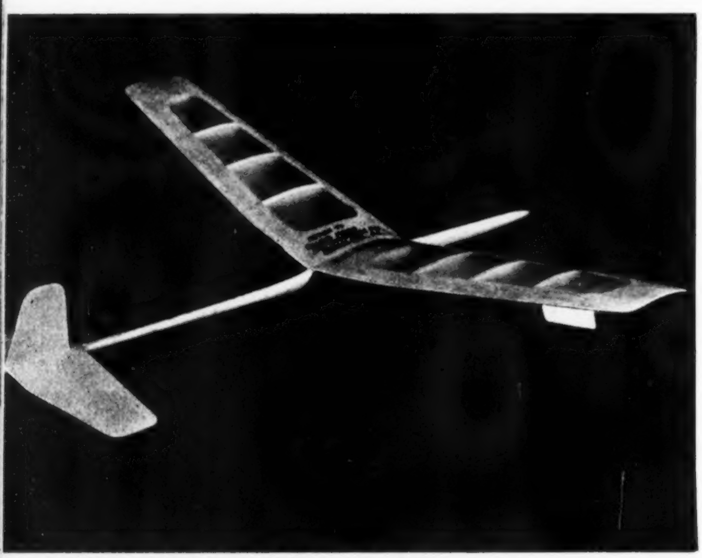


Thanks to the built-up construction, the wing is light, more shock resistant. This type of design usually gives a break to the guy with the weaker throwing arm. Covering should be Jap tissue.

REAL GONE

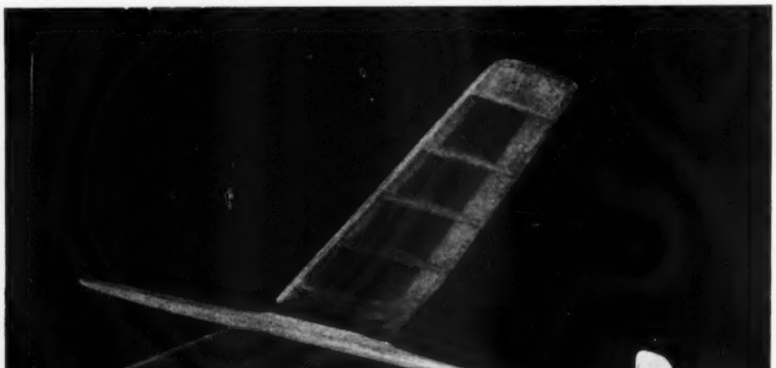
by ROLAND MAYER

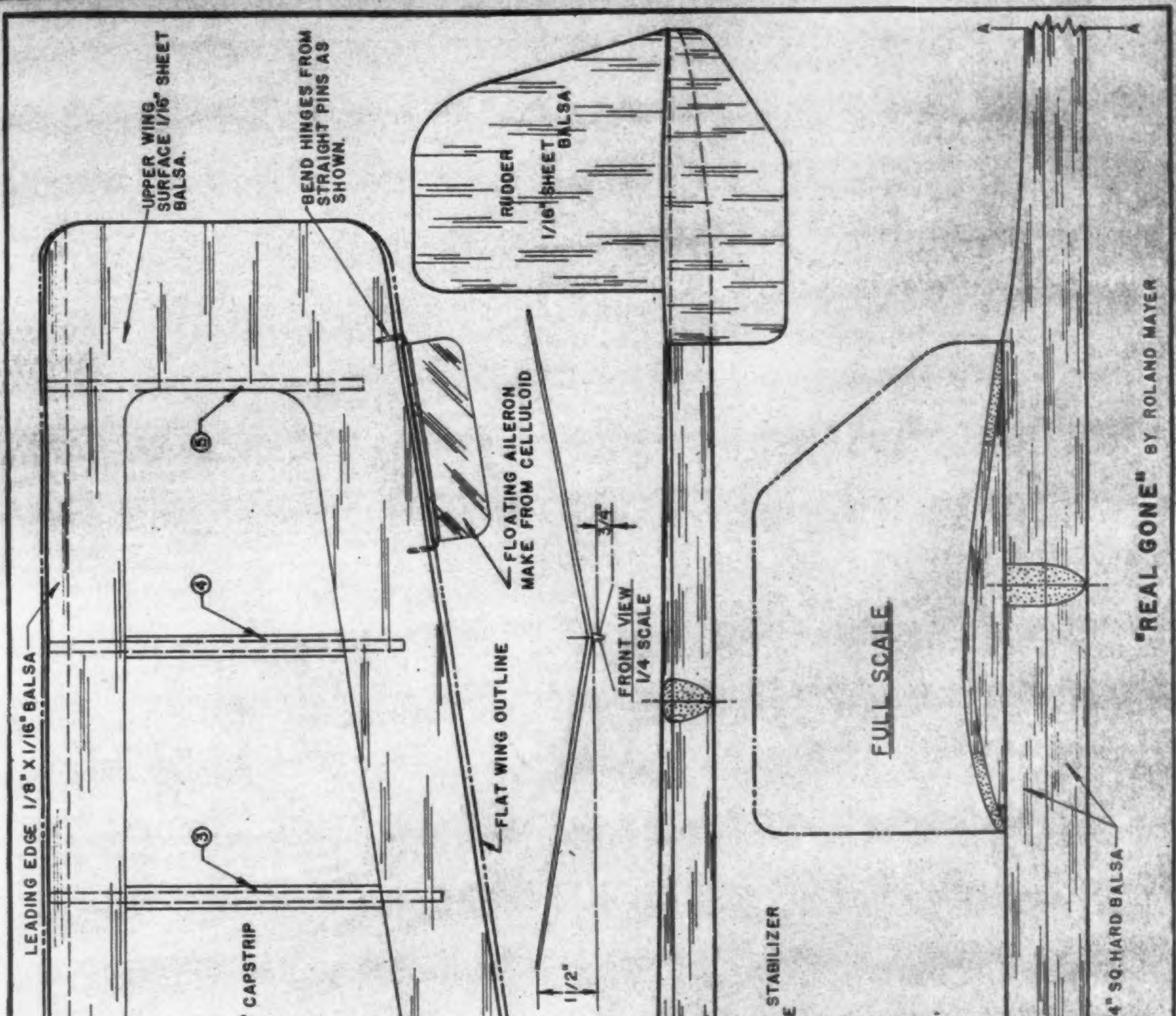
A high performance hand launched glider that will appeal to beginner and expert alike. Six of these gliders have averaged 1:15 in calm.



Unique on hand launched gliders is the floating trim tab for turn. Does not affect throw.

Below—Details of wing construction revealed in this photograph. Sheeting is over the ribs which are clearly shown. Cathedral—negative dihedral—keeps the nose up when making a downwind turn.




UPPER WING SURFACE 1/16" SHEET BALSA.
BEND HINGES FROM STRAIGHT PINS AS SHOWN.
RUDDER
1/16" SHEET BALSA
FLOATING AILERON MAKE FROM CELLULOID
3/4
FRONT VIEW 1/4 SCALE
1/2"
FLAT WING OUTLINE
LEADING EDGE 1/8" X 1/16" BALSA
1/8" X 1/16" CAPSTRIP
FINGER REST 1/16" HARD SHEET LOCATION OPTIONAL
WING RIBS
FULL SCALE
FLAT STABILIZER OUTLINE
STABILIZER
1/16" SHEET BALSA
1/4" SQ. HARD BALSA
A
"REAL GONE" BY ROLAND MAYER

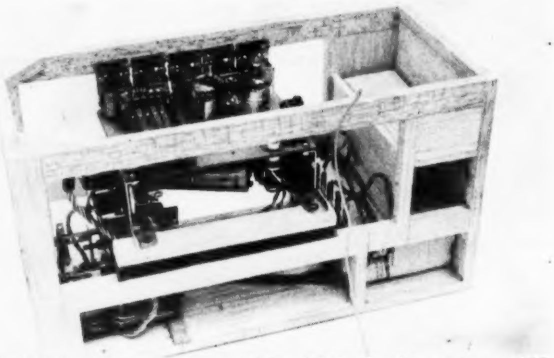
Three-tube receiver (Babcock Radio Eng., Inc., Van Nuys, Calif.) features tone, sealed relay, large current change, sensitivity. Weighs 5.3 ozs.

Left—Babcock hand-held transmitter. Fact that this system operates on tone will prevent accidental spin-ins due straight carrier interference.

For the RC Fan

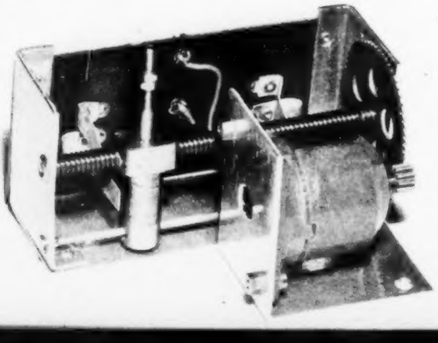
by ED LORENZ

Whether a "ham" or beginner yet to fly an RC job, you'll find much that is new and valuable in this column conducted by an outstanding authority.



Schmidt's five-channel as mounted by deBolt. Harold got two outside loops, inverted flight, and inverted roll in the glide. On 27.255 and tone.

Below—New ED servo. Electric motor, right, moves vertical actuator arm along screw shaft to open or close sets of contacts—one visible, left.



▸ Each month this column will deal with a specific technical problem, new items in the field of radio control, and news from RC modelers in this country and abroad. All readers are invited to send in any questions on RC as well as pictures and news items of latest developments and flying activities.

Big news of the month is the announcement of a tone modulated transmitter and receiver by Babcock Radio Engineering, Inc., 7942 Woodley Ave., Van Nuys, Calif. Priced at $29.95 for the receiver and $39.95 for the transmitter, this equipment is for single channel operation, and should be practical for various multiple-pulse systems. Babcock is the biggest manufacturer in the world of radio control for target drones. When Dick Schumacher took a month's leave of absence from his airline captain's job to consult with Babcock on missile problems, he was able to acquaint the firm with his concept of an "ideal" radio for modelers. Since Dick is one of our pioneers, the results are important.

The receiver features three hard tubes, requiring no tube selection; constant carrier with audio tone; minimum sensitivity of 5 microvolts for reliable operation under a wide range of A and B battery voltages; and a hermetically sealed relay, set to operate between 1.5 and 3 ma. When the relay tube is pulling full current, there is 1/3 watt of power in the 10,000 ohm coil. The current change in the relay is on the order of 6 mils. As the picture shows, the receiver is mounted in a can for protection and is easily installed by any popular type of shock suspension. Weight is 5.13 oz., and grosses 18.13 with recommended batteries, although pen cells can be substituted for mediums. Important from a modeler's point of view is the elimination of relay adjustments and of dirt in the contacts. Self-contained arc suppression protects the contacts. The receiver is immune to body capacity, has no tuning tricks, no overloading, is non-critical and tunes with a pair of ear phones.

The transmitter has a radiation indicator on the front panel which is tuned for maximum radiation. The 1/12 wave antenna is 36 in. long. Output is 2/5 watt, but receiver sensitivity is such that a 5-ft. plane may be flown near the limit of normal (*Continued on page* 42)

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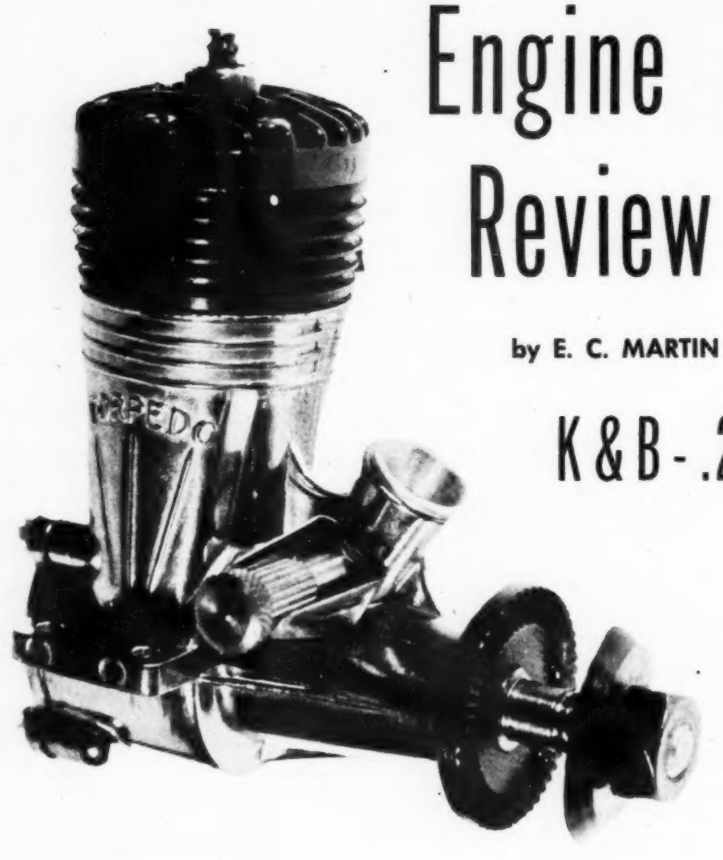

Engine Review

by E. C. MARTIN

K & B - .23

Fitting the same engine mounting holes as their .19, the new K & B .23 proves easy to start, smooth running, consistent and powerful.

▶ The performance of the record holding Torpedo .19 is common knowledge. This test is concerned with the .23 which has the same spaced mounting holes. The .23 lies approximately midway between the well known .29 and the newer .19. The latter is the more powerful for its displacement, although many of its working parts are dimensionally similar to those of the larger engine, and since the .23 also utilizes many of the same parts, one is inclined to speculate as to whether it will give a performance in proportion to the .29 or the .19. It will, in fact, show the student of engines where certain component dimensions reach the limit of their efficiency..

For those familiar with the Torpedo .19, the vital statistics of the .23 may be summed up as almost identical with those of the .19, but with a .040 in. larger bore, and several different secondary dimensions.

The crankcase is an aluminum alloy tumbled pressure die casting with a 1/16 in. wall thickness, 3/8 in. bore bronze bushing cast in position. The four-point 1/8 in. thick beam mounting lugs, large bore raked air intake, bypass passage, exhaust stack and main bearing are all cast integrally with the crankcase, with strengthening webs at all points of stress. Known as monobloc construction, it is probably the ultimate in strength and rigidity at the least weight.

The crankshaft is machined from steel bar stock and fully counterbalanced for all rotating weight. The 3/8 in. diameter shaft and thrust face of the web are brought to a good finish by centerless grinding. The 7/32 in. diameter crankpin has a fine machined finish and is drilled for lightness. A short 1/4 in. diameter gas passage conveys mixture from the large rectangular rotary valve port to promote smooth direct breathing.

The conrod is a polished duralumin drop forging with well finished bearings and an oval sectioned shank. The wrist pin bearing is long and rugged and controls the end float of the rod by occupying most of the available space inside the piston. The "big end" is provided with a lubrication hole at its lower extremity.

The piston is neatly machined from Meehanite or high grade cast iron to combine lightness with strength and freedom from distortion. This material is slightly self-lubricating and during operation tends to acquire a degree of surface hardness. It is therefore very long wearing and resists seizing up or freezing. The piston baffle is of average height and well filleted in the corners. It is also relieved to obviate scoring of the cylinder bore.

The skirt of the piston is hone finished to mate with the bore for the upper 5/16 in. of its length, the lower portion being slightly relieved by grinding to reduce frictional and oil drag. The wrist pin bearings are approximately 1/8 in. long at either side.

The cylinder is turned from steel bar stock complete with fins, the lower half, including the port belt, being ground to fit

accurately in the crankcase, and to insure that the seating flange is precisely at right angles to the bore in order to avoid distortion and malalinement when assembled. The exhaust port is wide and extends 130° around the circumference of the bore, with no obstruction to gas exit. Bypass begins .040 in. after exhaust through a 120° port fed from the large cross sectioned, beautifully alined and polished passage in the main casting. The cylinder is heat treated and blued for protection and appearance, and retained by sandwiching between the cylinder head and crankcase casting with composition gaskets at both joints and four tie bolts extending through all three components. The gaskets also serve to absorb differential expansion and thus prevent distortion of the cylinder.

Pressure die casting is responsible for the bolted-on crankcase rear cover and the attractive aluminum head which is finished in green enamel. The combustion face has a shallow contour on the exhaust side and the plug is centrally located. Two additional head retaining screws supplement the four tie bolts. A standard K & B plug is furnished.

The needle valve assembly, common to all the larger Torpedoes, is generously dimensioned, easily manipulated and holds its setting. The double ratchet is positive and precision construction makes adjustment progressive and non-critical.

A small bore removable venturi is provided for use where extra suction is required. This is machined from aluminum bar and locked in position by the spray bar, which is also removable and reversible. This venturi will be particularly useful for stunt installations, and its place may be taken by the K & B two-speed carburetor for RC and carries planes.

A flat on the crankshaft keys the blued steel prop driver, and a shoulder locates it,

to the correct position for bearing end clearance. A blued steel washer and 1/4 in. nut complete the engine. These parts are also common to the other Torpedoes.

The first impression one gets of the .23 suggests durability, simplicity and efficiency, and the test results confirm it. Delightful to start, smooth running, consistent and powerful, this new engine confirms perfectly to the Torpedo tradition. It comes attractively boxed with a 9 in. Plasticote prop, decals and full instructions.

Test: *K & B Torpedo* .23

Plug: K & B Standard. 1 1/2 volts to start. Fuel: Supersonic 1,000. Running time prior to test: 2 hours. Bore: .680 in. Stroke: .620 in. Weight: 5.6 oz.

Power Prop	*RPM*
10 x 6	11,800
9 x 6	12,400
7 x 10 1/2	13,450
7 x 9	14,150
7 x 8	14,500
Top Flite	
10 x 6	11,250
9 x 6	11,900
9 x 8	11,300
8 x 8	11,950
8 x 6	12,400

These figures were obtained while using the removable venturi, as the mid-class displacement of the .23 best suits it to stunt, sport and RC applications.

Real Gone

(*Continued from page* 30)

turning in excellent flights. The original ships, of which we have built six, averaged about 1:15 in calm evening air and several disappeared after picking up thermals, one on an official flight at the Philadelphia Plymouth Meet at Johnsville last year.

A few interesting features will be noted in the plans. First, the built-up wing is lightweight, while providing strength and shock-resisting flexibility. This type of structure should prove interesting to those who feel reluctant to hack a flying model out of solid wood.

Next comes the floating aileron used for several years on gas-powered models. We saw no reason why it should not be effective on gliders; and thus far it has worked out admirably, providing a smooth turn in the glide with no noticeable effect during the high speed launch.

Finally, the negative dihedral in the stabilizer is more or less a steal from the Wakefield jobs, some of which employ it to keep the nose up on downwind turns.

The fuselage is made from two lengths of rock-hard 1/4 in. sq. balsa, cut to proper lengths and cemented one on top of the other. When dry, wing and stabilizer platforms are marked off, then the rest of the member carved and sanded to the proper shape and cross section.

The rudder and stabilizer are cut to shape from medium 1/16 in. sheet balsa and sanded to a symmetrical section as shown. Then the negative dihedral is added to the stabilizer by cutting part-way through the sheet along the centerline, and cracking to the required angle. When this joint is cemented, one half of the stabilizer should be pinned flat to the work bench and the other half blocked up to hold the angle.

While the wing differs considerably from the ordinary solid sheet glider wing, it is still simple to construct. First, the builder should cut out the ribs and upper wing surfaces from medium hard 1/16 in. sheet balsa. Now, building one wing half at a time, pin down the ribs in the positions indicated on the drawing. Then after applying cement to the upper contour of the ribs, pin the upper surface sheet in place. We found it unnecessary to wet the sheet in order to follow the contour of the wing ribs; but if difficulty is experienced in this operation, soaking the sheet will eliminate the problem. Next add the 1/16 x 1/8 in. capstrips as shown, and allow the entire wing half to dry thoroughly. When it is dry, remove the assembly from the board, notch out the ribs, and add the 1/8 x 1/16 in. hard balsa leading edge member as shown. Now repeat process for other wing half.

To assemble the wing, bevel the mating surfaces of the halves so that they meet cleanly at the required dihedral angle. Now pinning one half flat to the board, join the other to it with the tip raised 3 in. off the board. When wing is dry, remove from board. Fill in between the two center section ribs with scrap balsa to provide a good mating surface with the fuselage. Finally, give the dihedral joint two additional coats of cement.

Before final assembly the wing is covered with Jap tissue, and given two coats of clear dope plasticized with about three drops of castor oil for each ounce of dope. Now the glider may be assembled in the usual manner with extreme care to insure zero-zero settings in both the wing and stabilizer when the joints are dry. The finger rest and floating aileron are added as shown.

The glider is finished by giving the fuselage and tail members two coats of wood filler, sanding after each coat. Then the whole ship is given two additional coats of thin dope, as prepared previously for the wing.

To adjust the model, add clay to the nose until it balances at approximately the midpoint of the wing. Then glide from shoulder height, adding or removing clay to obtain a flat turning glide to the right. A small amount of clay added to the floating aileron will tighten up the circle, if this is desired. For the actual launch, release the glider in a shallow bank to the right. The ship should climb steeply in a right-hand corkscrew, coming out on top in a slow circle in the same direction. From here on in it is strictly up to you and your track shoes.

Some R. C. Experiments

(*Continued from page* 27)

desired turn in almost any model configuration.

To make smooth turns, the model should be able to turn downwind without the nose rising. Here is another compromise between two design controls which are already being used to bring about other desirable features in the model. The dropping of the nose in downwind can be controlled by side area; longitudinal stability controls the rising of the nose into the wind. There seems to be no ideal answer here; all factors have to be considered to achieve the best all-around performance. It can be said that a model which possesses good longitudinal stability will have a distinct advantage when turning into the wind. In this case, the rising of the nose will be held to a bare minimum and all stalling or roller coastering will be practically non-existent.

Full scale operation teaches that an airplane flies in a moving mass of air and therefore turns in any direction encounter the same air speed conditions. However, the pilot of the RC job is stationary on the ground, the center about which the airplane

flies. All turns are made in direct relation to this ground spot, which means that we have to cope with ground speeds and not with the air speed.

The gliding angle is important because a steep, fast glide gives good wind penetration but loses valuable altitude quickly and the model is endangered by obstructions. Desired glide is fairly fast, yet flat, so that good penetration can be had with a low sinking speed. More than anything else, the glide is controlled by the CG location. A CG close to the center of lift gives a fast, flat glide with good penetration characteristics—this is most efficient performance. A forward CG location gives a faster, steeper glide with good penetration. A rearward CG location means a slow floating glide with poor penetration.

Then there are basic items, such as engine, fuel tank, remote control equipment, and landing gear, which latter does not affect the in-the-air performance. Considering the gear as a necessary evil, we would logically use as little of it as possible, and keep that use extremely simple. At the same time, we must expect it to enable the model to rise off the ground and provide protection as well as smooth landings. Full scale practice has shown that the simple two-wheel layout can be made to work very well.

An RC model cannot be quickly constructed and prepared for flight. The best answer is a simple, straight-forward structure that will stand abuse. We have said that one of the requirements of the model should be easy servicing of the radio gear; therefore, the model must be built around this equipment, all other structural factors being secondary. After a successful model had been developed on these principles, our group began to experiment with a number of interesting modifications. So far, however, despite radical innovations, the improvement amounts only to altering one of the compromises to change the type of flight.

One of the most interesting variations was an attempt to obtain similar performance from a model of the Air Racer style. Two such designs were built, similar but for size and power. The illustrations show how the layout looked and the changes made thereafter. These models were built simultaneously and were tested close together. Both proved impracticable. They were directionally unstable and, to a smaller extent, laterally unstable. Even under reduced power they tended to turn violently to the left, so much so that no practical amount of side thrust compensated. Experiments were made to find a possible solution in the location of the lateral area, or in the vertical tail size.

Nos. 1 and 2 were changes in vertical tail sizes, shown by the dotted lines. The dorsal fin was added first, by degrees: there was no improvement. Next, the sub-rudder was added along with the dorsal fin; the result was an extremely unstable flight ending in a dive into the ground. At least, we knew what *not* to do. The next attempt was made without the dorsal but with sub-rudder, for a lower lateral area. Using very low power we got the first successful flight, although left turn characteristics were still present. But, while the model was gliding along in straight flight, it gradually swung over into a right turn which resulted in a spin that even opposite rudder would not correct. In a major construction job, the whole aft section of the fuselage was lowered along with the tail, shown in dashed lines. This included removing some of the vertical tail from the top and adding it to the bottom, resulting in less vertical area than before. When tests were completed with this alteration, it was apparent that we had a model that would fly. Large amounts of side thrust would give straight flight and the model was controllable. However, a very un-


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desirable tendency remained. While gliding in a straight flight, the model would tend to fall off either to the left or right. Fortunately, opposite control would bring about recovery. At this point, we were at wits' end. Comparing the layout with the Live Wire design showed the side areas to be similarly proportioned, except for the wing location, which was about 2 in. lower than the Live Wire. Another modification raised the wing up to the same position. The plane became stable and easy to handle, side thrust was greatly reduced, and all turning characteristics were good. Today, this final version is still flying well after nearly a thousand flights, having practically worn out a brand new engine!

Besides the lessons learned in basic model design, other interesting factors were turned up by this model. It was fairly well streamlined. Of interest here is the fact that the speed was greater than the box type plane in the glide and under power. The size of the ship had been increased considerably over the first layout, to maintain speed and improve stunt performance by lighter wing loading. However, despite the increased size and lower wing loading, speed increased under all conditions and wind penetration improved.

The smaller version in the photo points to another interesting experiment. Conventional models do not fly very well in the inverted position. Usually, they must fly in a nose high attitude in order to develop sufficient lift from their flat bottom airfoils. The very factors that we use to obtain good upright flight tend to detract from stability in inverted flight. Upright flight is of course the most important and therefore its stability should not be tampered with; however, the inverted flight nose high attitude can be reduced without any great effect upon the upright performance. This can be done with a symmetrical type airfoil that lifts well under both flight conditions. On this particular model the symmetrical airfoil was set at the usual incidence angle and it was found that the model flew much like one that had a flat bottom foil. Major difference was a slightly steeper glide path. Unfortunately, without elevators, we never could analyze the effects of it while flying inverted. Further experiments with symmetrical foils have shown that they possess no undesirable characteristics and really do show great promise when the wing loading is not too high.

A half-size scale model of a projected radio model design was flown free flight with a symmetrical foil to determine characteristics under both flight conditions. The results were again most encouraging: the model flew in practically the same manner whether it was launched upright or inverted! In this machine the wing was set at a zero angle and the stabilizer angle altered to suit the flight attitude, which seemed even better for inverted flight. Large compromises were made with upright stability to get better action in inversion.

Since then two full size radio models have been built and tested using the zero set symmetrical foil. To date the results are far from complete, so it is difficult to predict results. We do know that any further experiments will be carried out with models using an .09 engine or less for power. A very high flying speed makes launching of larger size models difficult and such speed also increases the danger from them while in flight. Tests with a .19 powered version flying with an 18-oz. wing loading were dropped. One other point that came up is that reduction of wing loading from 18 oz. to 15 oz. had very little effect upon the flying speed while using this airfoil set-up. It must fly fast, probably because of the great reduction in wing drag.

Additional controls will change the type of flight, but will result in added weight. To keep the model size down without high speed flying, we must keep weight down too. This can be done with lighter radio equipment. However, the trend is in the opposite direction and we modelers have little control over it. We can reduce the model's weight without sacrificing strength; then we could stand heavier radio weight in the same size ships. With multi-channel equipment, hobbyists have gone to larger models for lower flying speeds and wing loadings. Larger models are heavier because of structure, and thus need larger engines. This means more dead weight. At this time, we can gauge our model's size fairly well by engine size. Our models are just about as big and heavy as they can be for the engines we are using. The engine becomes a good gauge of size.

Engine speed control is interesting, but is seldom useful when applied to a well-trimmed-out model. Elevators seem to have the brightest future at the moment, for they make possible additional maneuvers and improved quality of present maneuvers.

Aerodynamically, there seems to be practically no problem to elevators, but careful attention must be paid to the mechanical linkage. The elevators should not be too small if good, clean maneuvers are desired. A rather large surface (20 per cent of the total horizontal stabilizer area) moved through a 20 to 30° arc gives moderate action with smooth pretty-to-look-at maneuvers. Smaller surfaces moved through larger arcs cause mushiness or abrupt changes in direction. In work with large moving surfaces such as these, weight becomes a governing operational factor; hence, it is advisable to use only built-up structures of the lightest possible weight.

Today, radio control is comparable to controlline in 1940. As we learn how to use improved equipment, we will be able to branch out into specialized model designs for different types of flying just as is now done with controlline. Thrilling closed course "team races" can be had à là full scale Goodyear types. The Federation Aeronautique Internationale already has categories set up for RC world records and it will be interesting to see attempts made on the straight line speed records. Here the specialized model will scream by over the measured mile for all out speed. Other FAI categories include duration, altitude and distance.

There are at least two types of flying which should prove most interesting even if we use our general purpose models of today. With the addition of elevator control, real low altitude precision stunting should soon come into the picture. Once a flyer has mastered the technique, it should be reasonable to expect him to execute a stunt pattern within a very restricted area, almost in the deck. Another less spectacular, but interesting, event should be the cross country flight. Here, the model would be flown to a specified series of landing areas, all at a distance from the takeoff site. The pilot would land at each and check in with the officials, taking off once again to repeat the procedure, finally ending up back at the takeoff point. If this were competitive, the winner could be determined by the time consumed plus evaluation of his landings and takeoffs at each check point.

The RC trend will be toward more complicated machines. Usually, complicated machines mean more weight. With more weight we need more power, and so we follow through a vicious cycle until we wind up with a really high speed heavy missile. We all know how dangerous the RC models the Air Force is flying have turned out to be. Let's be smart and take a lesson from them by striving for safety. It can be done if the modelers do their part, and if the manufacturers do their best to keep the equipment down in weight.

END

Know Your Diesels

(Continued from page 19)

from the higher combustion temperatures of the Diesel. It therefore follows that since the lubricant comprises a large proportion of the total volume of the fuel, any power it may contribute is well worth consideration, therefor the lubricant should have good burning characteristics as well as excellent lubricating properties.

An engine running at high speed on nonnitrated fuel containing No. 20 lubricating oil will misfire and hunt at the smallest alteration of mixture strength, and will produce as much as 25 per cent less power than it would on No. 50 oil. The exhaust will be dirty and the oil thrown out will often be black and oxidized. The same engine changed over to No. 50 oil will graphically illustrate the importance of using heavy oil in Diesels. Many experts prefer castor oil because of its exceptional film strength, but its burning properties make it somewhat inferior to a good mineral oil. The writer has found Shell oils of No. 50-No. 70 weight hard to beat and as ether dissolves both mineral and vegetable oils, an excellent compromise is the use of 10 per cent castor and 15 per cent Shell No. 60. The main power component of Diesel fuel is its volatile oil content and there is very little choice between fuel oils, as they are all kerosine or paraffin in character. Actually, the more refined the oil, the lower its heat value. Some types of truck Diesel oil give smoother and cleaner running than kerosine.

The addition of ether is necessary because fuel oil alone requires very high compression in a small engine to achieve ignition. The reason for this is that a small engine dissipates heat very rapidly. In order to keep compression ratio within reasonable bounds, it is necessary to add to the fuel some agent which ignites at low temperatures. The most readily available volatile substance is ether. Ether also serves the secondary purpose of reducing the viscosity of the fuel so that efficient atomization may be accomplished with a simple carburetor. Many types and grades of ether are available of varying purity and effectiveness. However, most drug stores stock anaesthetic ether of approximately .720 specific gravity, for pharmaceutical purposes, which is the type most commonly used in Europe.

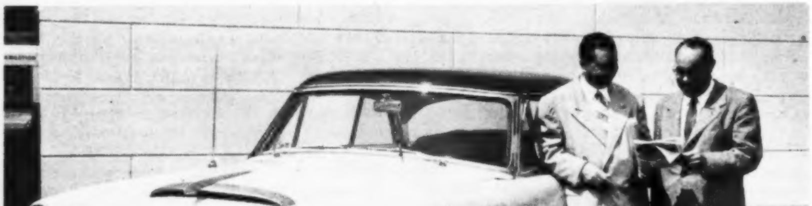
Since ether has a relatively low heat value, it would appear desirable to use as little of it as possible. However, within limits, an excess of ether will increase power output. One reason is that faster ignition of the charge is achieved with more ether and so slightly lower compression settings may be used for maximum power. Another reason is that ether has a high latent heat which helps to cool the engine bearings and crankcase, and therefore discourages pre-expansion of the charge and consequent loss of volumetric efficiency. As has been mentioned, short stroke engines require more ether than long stroke types for smoothest performance.

A point of interest to users of fixed compression Diesels is that ignition can be retarded by the addition of a suitable quantity of turpentine to the fuel. Such fuel tailoring is, of course, not necessary with variable compression engines.

There are several so called etherless fuel mixes that have achieved limited popularity. These employ small quantities of ethyl nitrate and nitrite in place of ether and usually contain the amyl salts as well. Their chief adantage is that a greater porportion of fuel oil may be used with consequently leaner mixture settings and better gas mileage per tank of fuel. This has an obvious attraction for the team racing fraternity. However, in practice, a small proportion of ether has been found desirable, as overheating and engine seizure frequently occur without it. The fuel is also rather too viscous for reliable carburetion, and engine parts are subject to corrosion from the high nitric acid content. An engine in perfect condition will extract slightly more power from these fuels, but for sustained operation and stunt flying, the normal ether-activated fuels are generally preferable.

Many thousands of earnest words have been written on the subject of how to start, handle and tune a Diesel, but the repair departments of the world's Diesel manufacturers contain a steadily growing monument to the inadequacy of such endeavor—the graveyard for broken parts. There is only one way to get results from a Diesel—by experience. One has to acquire the Diesel "feel" and the following words will not bring you 100 per cent performance. They will merely help you to diagnoze and correct faults.

To start, remember that, since ether is highly volatile, a fuel loses its strength very quickly upon exposure to the air. Therefore, when fuel is introduced into a hot engine, the ether content immediately vaporizes. Two or three ineffectual flicks will dissipate the ether vapor and further choking will be necessary. However, the fresh supply will mix with the oil left by the first, and the ether content will be proportionately diluted. The more you choke and fail to start, the more difficult starting becomes. Carried to its logical conclusion, the engine will be flooded with lifeless oil and the combustion space



Seeing is believing! This is the Mercury being given by Ohlsson Manufacturing Co. (Irwin Ohlsson, president, left) as first prize in their Ohlsson Gold Seal $5,000 Slogan contest. Information at dealers.

fills, causing a hydraulic lock. The piston will then not go over top dead center and any attempt to force it will damage the engine. This excess may be cleared by blowing through the exhaust with the piston at bottom dead center. It is a good idea, incidentally, to cause a hydraulic lock deliberately, so that the symptoms become familiar.

It will be evident that, once the engine is choked preparatory to starting, no time should be lost in flipping the prop, especially when the engine is hot.

When you are confronted with a new engine whose control settings are unknown, the following procedure will determine them.

Screw down the compression control until contact is felt between the piston and contrapiston, then back off the control two complete turns.

First make sure that the fuel line is full, then open the needle six turns and give the motor two choked flicks. Close the needle valve.

Prime the exhaust with two or three drops of fuel—don't flood it—and flip the prop hard.

If the engine kicks back or loosens the prop, reduce compression one full turn. Repeat if necessary.

Otherwise, keep flicking until the engine gives a burst. It is bound to start if you flick fast enough.

Having thus arrived at an approximate compression setting, progressively open the needle a turn at a time, priming, choking and starting until continuous running is obtained.

A good rule to follow in order to find the settings for maximum power is always to adjust compression first, then alter the needle to suit. This usually means raising compression and leaning the mixture. Work progressively on that basis, a little at a time, until a point is reached where the engine gives an unpleasant clicking noise and smokes badly. Back off compression and richen the mixture until running is restored, and that will be the maximum power setting for the particular prop.

A smaller prop which permits higher rpm will demand higher compression and leaner mixture, whereas a larger prop will require lower compression and richer mixture.

When an engine gives a burst of power and stops abruptly, the mixture may be either too rich or too lean, so always try restarting before making adjustments. If another burst is produced, raise compression slightly and lean the mixture. If nothing happens, open the needle and restart in the normal way.

With a little practice and a logical approach, you will find Diesels very reliable and surefire starters. Apart from structural failure or wear, nothing can go wrong.

Japanese Modeling

(Continued from page 24)

monoplane crossed the English channel in 1912. A picture of the plane was carried in the Japanese press. Never having seen a plane, and having no plans to work from, Kitamura followed the photo as best he could. Made of bamboo with a tin propeller, the craft had one drawback: because the picture photographed just one side of the plane and showed only half a wing, Kitamura's model had only half a wing.

It didn't fly.

His next planes were more successful: a Wright biplane (with two complete wings) and the German World War I fighter Taube.

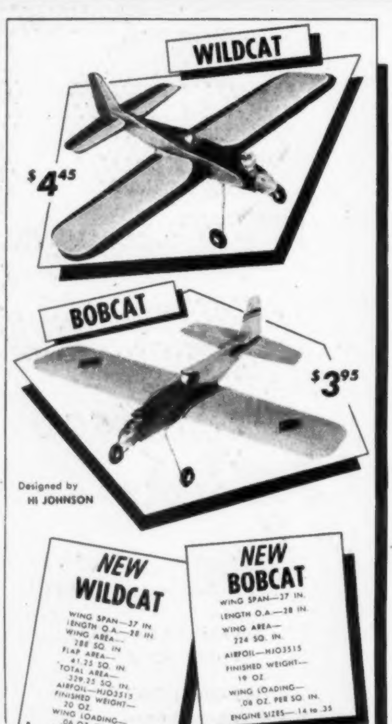
On through the years Kitamura continued his hobby. Many of his designs were highly original and unorthodox. He early experimented with gas engines, and flew controlliners before the second World War. In the years after World War II Kitamura led the swing to controlline flying. New to most Japanese because it had been developed in the U.S. during the war years, it gained immediate popularity and became first choice with many. Its popularity is still growing.

Besides building so many models, Kitamura has written many articles about model aviation, and often acts in an advisory capacity at many contests.

One American who has done much to cement Japanese-American friendship through modeling is Dallas Sherman, Pan American Airways representative in the Far East. Through his sponsorship the PAA Payload event has become a regular on Japan's modeling calendar.

American kits and magazines are snapped up by Japanese modelers. Anything "Stateside" is much sought after. For any readers who would like to correspond with Japanese model builders and exchange information and perhaps materials, Mr. Kazuo Asami of the "Mainichi" has graciously offered to act as go-between. Address him in care of the editor.

END



For the RC Fan

(*Continued from page 32*)

eyesight and yet respond to signals with the transmitter antenna pointed at the earth, with the tip 3 in. from the ground. Total B drain is 15-17 mils with or without modulation. Tone frequency is 900 cps. (Address Mr. S. K. Babcock when asking for information).

From L. Chioma Electronic Model Engineering, Inc., 6127 Alta Ave., Baltimore, Md., specs of their 27.255 superhet receiver and transmitter. Receiver features five tubes, for either carrier-wave or tone-modulated transmitters. Transmitter has two tubes, 100 in. whip, five watts input to final amplifier. Each unit priced at $49.50. The manufacturer feels that interference will be reduced because the receiver is extremely selective and thus capable of being tuned to a narrow band width.

The first thing a newcomer to RC asks about is radio equipment, what plane to build and what will it cost. Those who have been flying awhile have questions about "what happened on that last flight!" Having received quite a few of these letters, we'll try to answer the questions that come up most often.

A familiar query comes from Cpl. R. J. B.: "I am going to build a radio-controlled B-29. What type of radio and control hookup shall I use?"

A—First of all, the very thought of a flying scale B-29 makes us shudder! There is not just one engine to start, but four of them, all of which must be synchronized. As far as radio control is concerned, there is no commercial unit that could possibly offer the degree of control needed for such a plane. This type of model calls for a proportional type of control, whereby the actuators in the plane must react precisely with the degree of movement desired by the ground operator. The radio receiver must of necessity be more complex. Several of the major aircraft companies have flown prototype planes for testing purposes using RC. These planes have about a 10 to 14 ft. wingspan and are powered by upwards of 5 hp. The radio equipment is specially built and often weighs 5 to 10 lbs. and sometimes more. Needless to say, a model of this type is out of the class of the model plane builder. For a model builder starting on his first RC ship, we wholeheartedly recommend a single-engine, single-control plane. Such planes, in kit form, include the Live Wire series by deBolt, Guillow's Beam, the Bootstrap and Brigadier series by Berkeley, etc.

One of the most commonly asked questions by the modeler who has been in radio work for a short time is reflected in the following inquiry:

"What is the difference in performance between the gas tube receiver and the hard tube receiver?"—C. L. R.

A—The gas tube, or RK-61 (or English XFG-1) receivers and the hard tube (3S4, 3V4, 3Q4, etc.) receivers both have advantages and disadvantages. First we'll list those of the gas tube receiver:

Advantages: Compactness; light weight; excellent sensitivity; ease of operation, especially when built from a kit or separate plans; low battery drain.

Disadvantages: Relatively short life compared with a hard tube; cost of tube.

Advantages of the hard type tube are: excellent tube life, up to 1,000 hours or more; easy to obtain and relatively inexpensive; not overly critical regarding battery voltages.

Disadvantages: Bulkier and heavier receivers; sensitivity generally not as great as with a gas tube.

In general, if a compact, lightweight receiver is needed for a small ship, the gas tube receiver is usually the first choice. If

weight and space are of no great importance, the hard tube receiver will give good results. But hard tube sets can be carried in .09 jobs.

Q – Sometimes my crystal transmitter doesn't have much output at the flying field, even though I tune it very carefully on the bench at home. B. G. H.

A – A crystal transmitter, such as is now required by the FCC, is far more critical of adjustments than was the typical self-excited type used on 50-54 mc. This critical quality results mainly from the load imposed upon the frequency generating circuit by the external antenna system. This is especially true of single tube transmitters. When the transmitter is tuned on a dry workbench in your home and then placed on damp ground outside, the loading may change. The major cause of this is that a 1/4 wave vertical antenna, which is usually used, requires a "phantom" 1/4 wave going into the ground in order to make up a theoretical 1/2 wave antenna, which is a basic length for an antenna. Thus the characteristics of the ground upon which the transmitter is placed will have a bearing on the antenna loading. It is suggested that transmitters placed on the ground be provided with a 0-50 DC ma meter placed in the B-plus lead from the batteries in order to tune the circuit properly at the transmitting site. Hand-held transmitters of the single-tube type generally have less loading on the circuit because of a shorter antenna. Two tube hand-held or ground-placed transmitters are inherently more stable.

The following inquiry has been received from many British and Canadian readers: "Can I use the XFG-1 in place of the RK-61?"

A – In general, the XFG-1 and RK-61 cannot be interchanged and be expected to give the same results. Fundamentally, the difference lies in the LC ratio of the tank circuit; that is, the coil and condenser combination must be varied to obtain the correct ratio between the inductance of the coil and the capacitance of the condenser, and at the same time capable of being tuned to the frequency of 27.255 mc. When going from an RK-61 circuit to the XFG-1, decrease the tank capacitor by approximately 1/3 and increase the number of turns by approximately 1/5 to 1/4.

Q – F. J. S. has been told that a full 5 watts of input is needed to the transmitter to obtain reliable control.

A – This is a common misunderstanding among novice flyers. Actually, models have been flown almost out of sight and then back for a spot landing on about 3/4 of a watt of power from the transmitter. In order to accomplish this type of operation, the transmitter and receiver both must be properly tuned. If either one is even slightly off resonance, or improperly tuned, more power must be delivered by the transmitter to overcome this condition. While it is admitted that more transmitter power gives a certain safety factor, it is not imperative that excessive power be used for reliable control. Also, a ground check of 500 ft. often is equivalent to 2,000 or more feet when the plane is in the air. At this distance Class A and B ships are mere specks and usually the operator cannot efficiently control the model. Correctly tuned, any commercial unit will give excellent results.

Q – I am a "ham" operator and should like to use the two-tube Lorenz receiver on 50-54 mc. What changes do you recommend for this operation?

A – Figure 1 shows the changes needed to convert an RK-61 tube from 27.255 mc to 52 mc. The tank coil and condenser are reworked, as are the RFC and grid resistor. Adjustments are as given in the February '53 MAN.

L_1—Change to 8 turns #20 enameled wire, wound near open end of coil form.
L_2—Antenna coil is 3 turns #20 over L_1 and adjusted as per original article of Feb. '53.
C_1—Change to 10 mmf.
R_1—Change to 3.3 megohms.
RFC—Change to a 1/4 diameter form wound with 60 turns #32 enameled wire.

Q—Recently I attended a get-together of RC flyers and saw what I considered a lack of cooperation when everyone flew on one frequency.

A—So far this is a condition which has ironed itself out fairly well. We have 27.255 mc and 465 mc frequencies which are license-free bands, and also the popular 50-54 mc ham band. The majority of RC flying takes place on 27.255 mc, followed by 465 mc, while most of the hams operate on 52 mc. This means that in a crowd of 30 RC flyers, only one or two planes can fly at a time without interference to others on the same frequency. Signaling devices of all kinds have been tried to warn all concerned that a certain plane is about to fly on a given frequency. In a small crowd this works out fairly well; however, much needs to be done in order to prevent interference with planes in the air. One club has assigned one man as a monitor, with whom all flyers must check before sending up their planes, to make sure they do not interfere with a ship already in the air. It has also been suggested that each ship on a particular frequency be painted a given color, such as red for 27.255 mc, yellow for 465 mc, and white for 52 mc. This sounds like a good idea if the model builders could be persuaded to stick to one color scheme.

In closing, we should like to request again that you send in your problems, inquiries, and news on RC to this column. In this way, we can give all modelers a cross section view of what goes on in the RC field.

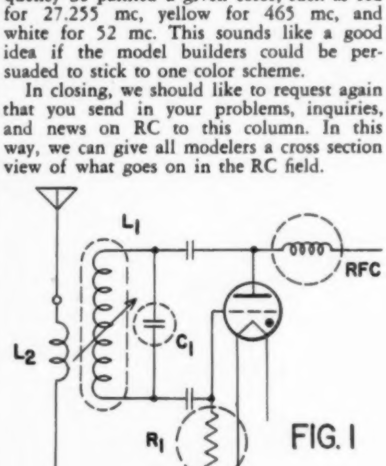


FIG. I

The Sabre

(*Continued from page 14*)

to trim the model very carefully by test gliding before attempting powered flight. The plans presented are intended to cover the main details necessary for the construction of the ducted fan and its components. Details of the wing, tail surfaces, and scale trim are noted briefly, as space permits.

Sabre construction starts from the inside because that is the simplest way to install the duct. Select a medium thick sheet of 1/32 in. balsa for the fuselage bulkheads. Trimming is facilitated and structure is strengthened if the bulkhead sheet stock is covered with a cross grain layer of tissue on both sides before the bulkheads are cut out. The bulkheads are best outlined on the sheet stock by tracing over carbon paper. Then they should be trimmed to size on the inner contours, but oversize on the outer. Make two of each and butt cement the halves together. The duct material is selected, thin 1/32 in. sheet balsa. Form this sheet stock by wetting it and wrapping it around a quart size soda bottle or a similar sized tube. This should follow edge cementing enough sheets together to form the largest diameter in the duct.

The duct sheet should dry on the forming cylinder while it is held in place by rubber bands. The duct walls, from bulkhead No. 5 to the tail, form a truncated cone. Therefore, the sheet which forms these walls must be tapered. This is best accomplished by rolling an undersize cone from the duct material and slipping bulkheads Nos. 5 to 12 over this cone. Then the cone is expanded by pushing crumpled newspaper into the larger end until the cone completely fills the circles inside the bulkheads.

Spaced properly, the bulkheads are then cemented to the duct walls except near lapped wall material. When the cement has dried, the wall, slit lengthwise in the lapped portion, will have perfectly mated edges. When the excess sheet material is removed, the remaining edges should butt together closely. A seam of cement at this joint should dry while the expanding paper is still inside the duct.

Upper and lower keel strips which form the structure backbone forward of bulkhead No. 5, cut out and attached to bulkhead No. 5, permit location of the remaining bulkheads in their proper places. The general arrangement of these bulkheads can be seen on the plans and in the photograph of the fuselage internal structure.

After the bulkheads in the forward fuselage portion are in place, the bond paper duct walls are installed by "cut and try" procedure. The intake duct walls need not be very smooth, but sudden changes in the duct internal section area should be avoided. If installation of the intake ducts generally follows the photograph of the fuselage internal structure, performance will be satisfactory.

Additional pieces corresponding to the upper halves of bulkheads 5 and 7, and the strips which form the horizontal frames and edges of the access door should be cut out and cemented in place according to the plans, then the nose carved to approximate shape and cemented in place. When all cement has dried well, fuselage bulkheads should be trimmed to their proper contours and the whole assembly sanded to make a faired body when covered.

The fuselage is covered with strips of thin 1/32 in. balsa sheet, though if tissue is preferred, the established practice with stringers should be followed. The Sabre was originally covered with tissue and was only 2/10 oz. lighter than when planked. Some ballast may also be necessary at the tail of

the tissue covered model. The planked model required none, and the center of gravity is indicated on the plans. The fuselage near the wing root remains uncovered until the wing is mounted on the fuselage. In cutting out the access door, location of the door frame can be determined by inserting a pen-light in the duct and observing the shadows of the frames. The edges of the door and frame should be sanded to insure easy opening. If hinging and latching are not done according to plan, the builder is cautioned that door latches must be designed to permit automatic locking. Thus a minimum of time is lost, after the engine starts, in getting the plane airborne.

The fan is made next with .032 in. thick, soft aluminum. After the shaft hole is drilled, a pair of sharp dividers will help scribe very accurately the 3-in. diameter circle for the fan. Then a hexagon inscribed within the circle may be a base upon which to construct the fan outline. The outline shown on the plans has been found to work best. With sheet metal shears, the fan is cut to approximate shape, then very carefully filed to proper shape, while balanced by a drill bit shank through the shaft hole, supported on a pair of *level, parallel, straight* edges. Accurate outline construction and careful shaping of the face eliminate the need for much balancing.

Next, the engine mount is constructed. The block, labeled IM on the plans, may be of hard balsa or soft pine. It should be noted that the bolt holes are angled inward in the plan view. Power plant space is at a premium in this type of model, so the angle was adopted to allow a taper in the mount block and give more duct area aft of the engine. The engine mount support is a long cone of 1/32 in. balsa and parts 1M, 2M, 3M, and 4M. Thus, because of its high stiffness, the mount is free from vibration. The

In the August issue a heat-range chart of representative glow plugs was presented. The list is expanded here to include OK plugs; additional plugs will be listed when data is received.

TYPE OF PLUG IN ORDER OF HEAT RANGE

1/4-32 SHORT REACH

HOTTEST
- ATWOOD STD.
- SPITFIRE
- OHLSSON HALF A
- ATWOOD (NEW TYPE)
- K & B STD. †
- OHLSSON RACING
- OK†
- THIMBLEDROME HOT SPOT †
- K & B EVERGLO †
- CHAMPION VG 3 †
- OHLSSON STD. †
- K. L. G.
- ARDEN

1/4-32 LONG REACH

HOTTEST
- OHLSSON RACING
- OK†
- CHAMPION VG 2 †
- OHLSSON STD. †
- ARDEN

3/8-24

HOTTEST
- OHLSSON RACING †
- CHAMPION VG I †
- OHLSSON STD. †

† DENOTES ABILITY TO WITHSTAND 2 VOLTS FOR STARTING

true length of the struts in view AA is determined by the roundness of the duct. Therefore, these struts must be fitted by trial after the mount is centered in the duct.

When the cone shaped mount has been completed, the engine should be temporarily installed and the fuel tank connections tested with water. Then, after the engine and mount assembly are in the duct, the fan should be put on the engine shaft and the prop nut tightened. The starting cap need not be installed until the model is finished. With the fan in place on the engine shaft the mount can be centered by wrapping the fan with bond paper until it fits snugly into the duct. If the duct is out-of-round in places, these spots may be enlarged by slitting the duct wall and pushing it outward a little, then recementing it in the offset position. Try the door with the fan still wrapped and adjust it until it closes smoothly. The clearance around the fan should be about 1/32 to 1/16 in.; however, good thrust has sometimes been obtained with as much as 1/8 in. clearance. With the fan centered in the duct, the mount struts can be trimmed to fit and then cemented in place. Once the cement is dry, the fan and engine may be removed until the airplane is finished. The builder will now realize that a special right angle screwdriver (obtainable at any dime store) will be necessary for engine changes.

The wing is of multistringer construction, which is resilient in a wing first ground contact, and also looks good when covered and painted aluminum. A *left* and *right* wing should be made, and stringers, shear webs, and tip are added. The wing can then be sanded to shape, and the aileron tabs trimmed and installed. The essence of a good tab is its ability to maintain adjustment during hard landings. The use of sufficiently soft but stiff aluminum strips for hinges is recommended. Also the tab should have a narrow chord so that minor adjustments do not overcontrol the model. The wing *must not* be covered before installation on the fuselage. On the installation procedure, the stringers are trimmed back from the airplane center line to the first rib, omitting the leading and trailing edge. The plan view indicates the exact dimensions of the leading and trailing edge cut off. Now, with the wing placed precisely as it is to be on the finished model (*the wing incidence is zero and the dihedral is shown on the plans*), the leading edge, the trailing edge, and the ribs are cemented at bulkheads 5 and 6. When this cement is dry the model may be lifted from the jig and the wing checked for alinement, followed by installation of the carry-through structure and root fill-in sheets.

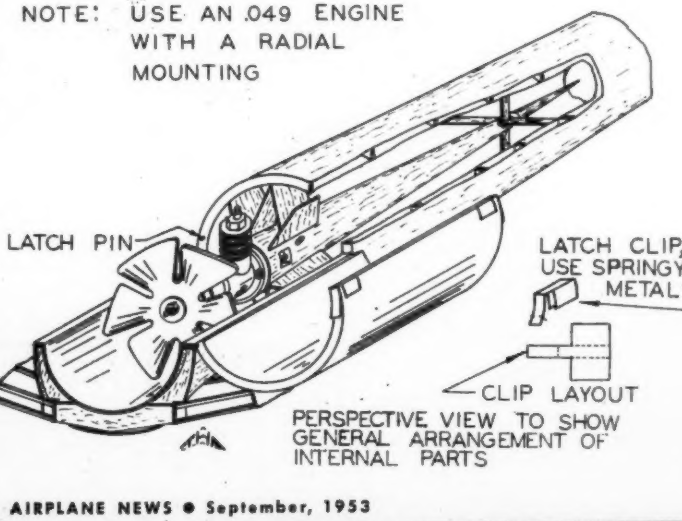
The horizontal surface is constructed over the layout shown on the plans. In similar fashion the vertical surface can be constructed. All surfaces are covered, and the tabs are trimmed out and re-installed with soft aluminum hinges. After the superstructure is built at the tail of the fuselage, the vertical and horizontal surfaces are mounted. As with the wing, proper angles must be set before cement is applied.

The wing is now ready for covering, with the model on a *flat* surface and wingroots alined parallel to the surface. Pins and scrap balsa will jig the tips to 5° negative incidence, and allow covering the upper surface while it is thus held in position. With the model upside down the lower surface may be covered. The tip washout has been put in to prevent tip stalls. In order to insure symmetrical alinement of the wings, it is suggested that they be jigged into position while the covering is being sprayed and doped. This alinement of the wings and surfaces is very critical. This writer believes

that most flight troubles arise from small misalinements of the wings and tails.

The sketched canopy is stretch-molded cellulose acetate, but the builder may use alternate forms of structure. The molded canopy plus a pilot with a white crash helmet gives the model that "real airplane look" when it is in flight. The builder will decide insignia and color scheme. The model shown is of the YF-86D, but the airplane is now in production and many colorful squadron insignia will soon appear in pictures of the plane.

Successful flying of the model depends on patient adjustments during test glides and initial powered flights, preferably made in a field with high grass. The model should be held just ahead of the wing during launching and a fairly rapid thrust given. Trim the model to glide as slowly as possible and make a *slight* turn to the left. The intake on the underside sucks the nose down under power and gives the same effect as heavy down thrust. Therefore, the model flies at a good speed under power and then slows down for a safe gliding speed with power off. The first powered flights should be in *calm* air, so a little patience in this respect will be greatly rewarded during the initial flight stages. The Sabre will fly well in average breezes but it is not made for high winds. Other flight patterns can be tried after the characteristics of the model are learned.



Russia's Engines

(Continued from page 12)

The various Russian engines listed comprise both gas engines and compression-ignition motors. It is not known how many of these have reached the production stage, but we believe that few have been produced in any quantity. Only in a few cases have the engines been given names. Instead, most of them are identified by a type number, prefixed by a letter, or letters, usually derived from the initials of the designer. This, of course, is favorite Soviet practice, as is shown by its adoption as a means of aircraft designation.

The Russians do not appear to adhere at all closely to the FAI displacement groups. There are a number of .60's which have evidently been built to come within the FAI 10 c.c. (.61 cu. in.) limit, but the piston displacements of most of the smaller sizes bear no relationship to the other FAI categories. The .60's include part of the AMM series, the F-4, the MB-02, the MB-05 and K-10, all of which are spark-ignition gasoline engines.

The AMM jobs are among the older types and are comparable in general specifications with pre-war American engines such as the Brown Junior, being three-port motors with moderate compression and medium-high stroke/bore ratios. They are rated at around 1/5 hp with correspondingly low rpm. Like the Brown, induction and exhaust ports are at the back of the cylinder, while the by-pass is at the front.

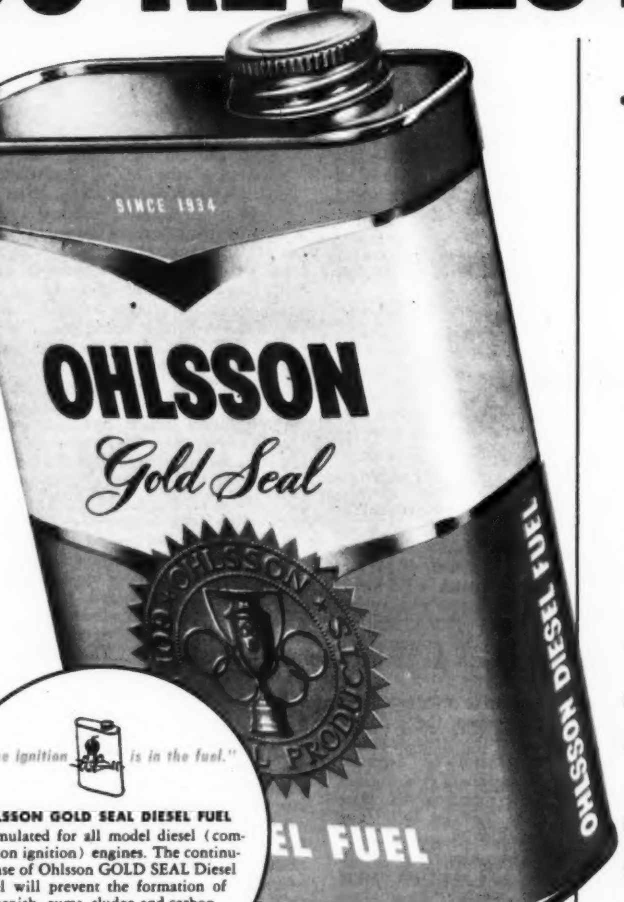
Cylinders remain integral steel units with non-detachable heads, turned fins and external by-pass passages. In each model, they are attached to an aluminum crankcase which has a detachable front cover carrying the main bearing. This cover is flanged and secured to the case with three through-bolts. A plain bush is used and the crankshaft is quite short. The shaft, which is of a simple balanced pattern, is squared off in front of the bearing to take the prop driver and cam for the ignition timer points. The timer is an open type, manually adjustable for advance and retard and has adjustable points.

The carburetor assembly is very similar to the Brown and has the same type of rotating sleeve choke with knurled end and flat steel check spring. The vertical spray-bar type needle-valve, too, has a similar check spring on the needle sleeve. Lapped pistons are used with flat crowns and a straight baffle at the front. The connecting rod employed in these engines is slender and rather long by present-day standards. This, of course, results from the lengthy stroke combined with rather a long piston skirt and the fact that the bottom of the stroke starts well above the crank-throw, unlike most modern designs in which the piston skirt overlaps the crank-throw at bottom dead center.

Earlier type AMM designs had a rather bulky type of spark plug. This type of plug was also fitted to some of the smaller Russian engines and, in such cases, the diameter of the plug was sometimes as big as that of the engine cylinder. From examination of the design, it would appear that this bulk was necessitated by the limited capacity of the insulating material used. Subsequently, however, some conventional pattern miniature plugs, using porcelain type insulators, appeared. From photographs seen, one or two Russian engines have used Champion plugs — or, if not this actual American product, a very good copy of it.

A large number of Russian engines are now of the shaft rotary valve type. One of the biggest of these is the .60 cu. in. MB-02 designed by V. Petukhov. The appearance of this engine is again somewhat akin to the Brown Junior. The cylinder and head is again in one piece, with ten integral fins, and

SO REVOLUTIONARY



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OHLSSON GOLD SEAL DIESEL FUEL

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Newly developed chemicals used in Ohlsson GOLD SEAL Diesel Fuel are the magic ingredients that make engines start easier, run smoother—deliver terrific power and better all-around performance. *It makes old diesels run like new and new diesels run better.* Team racers are finding that they get more mileage with Ohlsson GOLD SEAL Diesel Fuel than anything they have ever tried.

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the by-pass is in front. It is secured to the crankcase with four machine screws around a base flange. The crankcase is integral with the front housing, a screw-in rear cover being used.

The MB-02 has a bore of 23 mm. and stroke of 24 mm. The piston has a slightly domed head with a contoured baffle formed at the front. The wrist-pin bosses are in a separate yoke insert which is screwed into an internal thread in the upper part of the piston. Below this are piston ports which register with the bottom by-pass port at bottom dead center.

Here again a choke sleeve is fitted to the air intake and the needle extension is raked back from the propeller disk. The timer is more compact than on the AMM models, cam and breaker arm being enclosed in a circular casing behind the prop drive disk, but the points are left exposed. According to published performance curves, the engine gives 0.4 hp at 6,600 rpm.

A more advanced design and, in fact, one of the most powerful of Russian engines, is the MB-05. As will be seen from the illustration, this approaches modern design trends more closely and has some superficial resemblance to the Super-Cyclone and O.K. Super 60. Bore and stroke of this model are 23.03 x 23.9 mm., giving a stroke/bore ratio of 1.037/1 and a displacement of .6075 cu. in.

A much higher compression-ratio is employed than that found on the other engines mentioned and an output of 1.28 brake hp at 13,100 rpm has been claimed. However, it is very doubtful whether such a performance could be achieved with this design and the more conservative figure of 0.72 bhp at 11,000 rpm, derived from the power curve reproduced here, would seem to be much more probable.

Two short-stroke, disk-valve .60's are listed in the name of A. Filippchev, the F-4 and another which, translating from the Russian, apparently rejoices in the name of "Schmel" —whatever that may mean. These two engines are of virtually identical specifications. Bore and stroke are 24 x 22 mm. in each case, giving a displacement of 9.95 c.c. or .607 cu. in. Neither their low stroke/bore ratio nor the use of a disk valve indicates racing engine characteristics, however. The engines have a moderate rating of .03 bhp at 6,300 rpm.

A. V. Filippchev also has one or two smaller disk valve gas engines to his credit. Two of these are designated F-3 and F-5, while a third is named "Komar." The F-5 and the Komar are .30 cu. in. motors having fairly short strokes but low compression-ratios. Although similar in these respects, however, construction of the two motors differs somewhat. The F-5 has a rectangular section crankcase with detachable front and rear covers secured by four screws, whereas the Komar has the main bearing housing and crankcase cast in one piece with a circular rear cover attached with three short machine screws. Cylinder porting and timer design also differ considerably.

The F-3 model is a 2 c.c. (.12 cu. in.) motor embodying various characteristics of the larger Filippchev engines. As in the two .30 cu. in. motors, the by-pass is at the back of the cylinder and the entire cylinder is flanged and attached to the crankcase with two machine screws. A horsepower rating of 1/10 at 7,500 rpm is quoted for the F.3, which is logical, but the same rating, achieved at 4,500 rpm for the .30 cu. in. models, seems unduly pessimistic and ought to be bettered by actual tests.

Also of .12 cu. in. is the MB-01 model. This has the same bore and stroke as the F-3 just described, but is a shaft valve engine. It has quite a neat appearance, the cylinder being flanged and attached to the crankcase casting with four screws. A screw-in rear cover is used and the by-pass is at the front. A rating of 1/10 hp is also quoted for this model.

The MB series also includes a .30 cu. in. model known as the MB-03. This is another shaft-valve model but has an updraft intake. It has an exhaust stack located on the left side like the bigger MB-05 model, the by-pass being opposite. Once again, the horsepower rating seems rather low. The figure given is 1/6 hp, but the peak rpm is not stated.

Most Russian gas engines are for beam mounting, but a radial tank-mount is featured by the MZ-2, constructed by M. Zurin. This is a .28 cu. in. shaft valve job and also has a rather unusual induction arrangement. In this, the carburetor is mounted under the tank, from which it is fed direct, the jet needle being inverted. From here, the fuel-air mixture is conducted through a long induction pipe to the front of the crankcase where it enters via a normal shaft valve. The rest of the engine is of conventional design, except for the fact that the timer is fixed and cannot be adjusted for advance and retard—a seemingly unwarranted simplification which has not been seen on our own engines since the very earliest days.

It is evident from the foregoing descriptions that Russian gas engine designers have favored a one-piece fabricated cylinder, rather than the linered alloy assemblies with detachable heads now used by the majority of American and European designers. Very few Western products now use external brazed-on by-pass passages. Instead, the crankcase casting is generally extended at least sufficiently to take care of this, if the cylinder is not completely jacketed. This now largely discarded method of construction, however, also persists in the design of many Russian Diesels.

As we would expect, the average Diesel displacement is somewhat less than that of the gasoline engines, although there are several Diesels which are much bigger than any now in production in Western Europe. One of these is the .454 cu. in. MK-03. This is a shaft-valve motor with a rather unusual type carburetor. Here, the needle-valve is placed *vertically* in the upright intake. The needle passes through a tube, the bottom end of which forms the jet into which the needle seats. Fuel enters the tube from the top and air enters the intake through slots at the side. The air, of course, flows parallel to the jet tube and draws off fuel from the jet in a manner similar to that of most full-size carburetors.

Another large Diesel is the MK-09. This is a more advanced design and is undoubtedly quite powerful. The claimed output of .62 bhp at 10,400 rpm would, in fact, put it among the most powerful Diesels yet built. It is a much better looking engine than most, has a finned head and ball-bearing shaft. The rather lengthy compression lever visible in the photograph was presumably to facilitate access in a cowled installation. Virtually all Russian Diesels, incidentally, follow the now almost universal practice of employing variable compression by means of a contra-piston.

Other MK series Diesels include the MK-02, a .15 cu. in. shaft-valve model and the MK-05 of .06 cu. in. and .1 cu. in. MK-06, both of which are three-port designs.

The smallest Russian engine for which we have been able to obtain any information is the F-15 Diesel. This has a bore and stroke of 8 x 8 mm., producing a volume of just over 0.4 c.c. or .0245 cu. in., which is about half the size of the popular .049's produced in the U. S. This is a neat looking little three-port job with a reputed weight of 29 grams, or just over 1 oz.

One of the more distinctive Russian de-

signs is the OK-20. This is a fixed compression Diesel having a form of 360° porting. Exhaust ports comprise a ring of circular holes, while the by-pass consists of a series of vertical drillings through the lower part of the cylinder wall (the wall being thickened for this purpose) which take a right-angled turn to discharge into the cylinder just below the exhaust ring. The by-pass volume seems to be rather small, but this appears to be one of the few attempts to produce something on the lines of the circumferential porting systems so popular in Western countries.

The displacement of the OK-20 corresponds roughly to the American Class A group. Between this size and .30 cu. in. there are a number of Diesels, none of which achieves anything particularly noteworthy from the performance angle but which, nevertheless, display some interesting diversities of design.

One of these is the shaft-valve KMK-1, illustrated. This motor has the fuel tank built around the main bearing, a feature not entirely unknown among early Continental Diesels, but the most curious feature is the air intake which is right-angled into the airstream and has an adjustable spring-loaded plunger fitted in the bottom.

The F-12 is another motor having the fuel tank built around the main bearing. In this case, the crankcase, lower part of the cylinder and rear half of the fuel tank are made in one piece. The air intake (the engine is of the three-port type) faces forward and leads directly into the cylinder. The needle-valve projects vertically from this and is provided with a flexible extension leading back alongside the cylinder head.

Of virtually identical layout are the K-16 and AMM-12 models. It is possible, in fact, that these may be alternative designations for the same basic design since it is believed to have been chosen for quantity production. Both models are shaft valve engines with the intake arranged below the main bearing and a gravity-feed fuel tank mounted above it by means of a single screw into the bearing housing. The design uses a one-piece crankcase and front housing, with a screw-in rear cover and the cylinder flanged and attached with four screws. An alloy head, carrying the top three fins, screws over the top of the cylinder. The shaft is counterbalanced and runs in a full length bushing.

In the Russian book we have mentioned, *Piston Engines for Flying Models*, a construction feature is included to enable Russian modelers with the necessary facilities to build a small Diesel, the TSAML-50. This is a neat three-port job of .11 cu. in. displacement and its structural design conforms a little more closely to European methods of construction. The motor is very similar to the Czechoslovakian Super-Atom and, in fact, has the same bore and stroke. Design embodies the use of an aluminum crankcase which, unlike most Russian engines, includes the by-pass and extends up above the exhaust ports. A steel cylinder-liner is used and this has a plain flange which seats on the top of the crankcase casting. The whole assembly is then locked together by the duralumin finned one-piece cylinder barrel and head which screws down over the top of the crankcase. As far as quantity produced designs are concerned, this arrangement is identical to that of the British Mills .045.

The piston is of steel and uses a duralumin wrist-pin yoke screwed in. The con-rod is of steel, to the Russian specification U.6, and the crankshaft, which has a plain full disk web, is of steel U.8 and runs in a bronze bearing. The motor is for radial mounting and seems to be conservatively rated at .06 bhp at 4,500 rpm.

As far as glow plug engines are concerned,

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these appear, so far, to be mainly adaptions of existing spark-ignition models. A typical plug is illustrated. It resembles earlier Russian spark plugs in external appearance and is large compared with American and European glow plugs.

In all, the Russians seem to be a good five years behind ourselves in model engine design. The engines we have reviewed are in no way slavish copies of the products of Western countries, and this is a field where Russian modelers would undoubtedly profit by a study of recent American and European progress.

Aero Commander

(Continued from page 20)

Cut out the wing ribs from hard sheet stock. Select a piece of hard balsa for the leading edge and taper each piece as shown, but don't cut out the contour in it until the wing is planked. Select a sheet of hard balsa for the spar. We picked a hard sheet with the grain running diagonally and cut the spar out in one piece, balancing the run of the grain to avoid a weak center. Pin the spar, bottom 1/8 in. strips and the ribs in place for the first panel. Add the top 1/8 in. strips and the wing tip block. The 1/8 may seem fragile but it is only used to back up the butt joint of the planking. They are spaced 3 in. from the leading edge for 3-in.-wide 1/16 in. planking. Build left and right wing frames and join.

If your spar is one piece, build one side, tip it up to lay the spar flat and then build the other side. Gusset the center joints and cement freely. Now drill through the ribs for the leads and install the bellcrank, the mount and the wire line leads. Now plank the top of the wing only. Incidentally, there is no trailing edge, the skin being lapped and cemented to form this member. You will note all through the ship that the frames are weak. This is intentional since we are trying to load up the skin too instead of just using it to cover openings. You will find the finished components very rugged, so put away those plywood braces, and follow the drawings.

Now bend up the main gear legs using 1/8 in. wire and mount on the nacelle bulkheads with J bolts. Cement all the nacelle bulkheads in place using fuel proof cement or, as we did, Weldwood. Note in particular the leading edge cut-out for the firewall bulkhead and the dowels driven in to beef up this area. Now add the fuel tanks and engine mount nut plates. We used the wedge tanks shown which are homemade although any commercial wedge is okay. Now finish the wing planking and strip plank the nacelles. Carve to a finish the leading edge and sand the entire unit until a fine finish reveals no joints. Now cover the whole unit, preferably with silk, or use Silkspan, and coat with fuel proof clear dope until a slick ready-to-paint surface is achieved. This calls for generous application of elbow grease. Use fine sandpaper, and for a fine finish, work from the frame out. No filler or sealer of any sort apart from clear dope was used on the ship in the photos.

Carve the engine cowls next, fit them up to your engines, and cement the lower halves to the firewall bulkheads. The top halves are removable for access to the engines and should be provided with your favorite type cowl catch. We used a piece of music wire bent in a semi-circle to clip on the engine cylinder head. The other end of the wire is embedded in the cowl piece and cemented freely. The dowel locaters are then added to position the upper cowl halves. This completes the unit, which should weigh about 18 oz. with wheels and without engines.

The tail components are simple and straightforward. Note that hard 1/32 in. is used to plank the tail assembly. It too is silk covered. The only unique feature here is the scale hinge line and homemade hinges shown. We always use tube and wire type hinges anyway for their strength, freedom of movement and ruggedness. However, standard cloth hinges can be used which will eliminate the scale hinge line. Do not attach the elevators to the stabilizer just yet.

Cut out the pieces for each fuselage side, and the nose pieces too, but not the windows, which should simply be drawn with pencil for the present. Cement the side pieces together to form finished sides. Cut out all the bulkheads while the sides dry. When the sides are VERY dry, set them up on the rear lower flat edges and add the rearmost bulkhead. Line up the sides at right angles to the bench surface with a triangle and let it dry thoroughly. When it is set, add the remaining bulkheads and vertical braces to complete the frame. Now plank the top and bottom from the wing trailing edge position to the rear and from the leading edge forward except for the top of the nose. Now add the fin, dorsal, rudder stabilizer and the elevators, attaching a piece of 1/16 in. wire pushrod long enough to reach about an inch through bulkhead 9 with elevators in neutral position. Now bend up the wire nose wheel frame as shown and mount it in the nose. Plank up the top of the nose section and add the nose and tail blocks. Now that the fuselage has rigidity, cut out the windows and sand the whole works.

Fit the wing in the slot and cement it thoroughly. Add gussets and more cement from the bottom through the opening in the fuselage, and line up the wing carefully before the cement sets. When it is dry, finish the fuselage planking, sand completely and cover with silk and clear fuel proof dope as you did the wing unit. Our ship required four heavy coats of clear with in-between sanding to achieve a fine surface to paint.

The original is red and white, as is the prototype with the design shown in the photos and drawings. All lettering and striping is red. How to go about getting a mirror finish has been described so many times, we won't go into it again here. One thing is sure: there is no easy way. It takes a lot of dope and a generous mixture of patience and work, no matter whose system you use. Anyone can get a good finish if he is willing to spend time, so go to it! We didn't go all out on ours, yet it is passable. It took four coats of color over four of clear. All the stripes and lettering are Trim Film.

Now balance the airplane 1-1/4 in back from the leading edge at each tip. If you need ballast, add it now through the windshield and window openings. Add the windshield center brace, windshield and side windows.

For flying, the two tanks should first be thoroughly filled. Now start the inboard engine, adjust it and then pinch off the fuel line until it quits. Don't touch the needle valve once it is set. Refill this tank immediately and choke the engine once. Now start up the outboard engine and adjust to peak. Letting this engine run, go back again and fire up the inboard engine, not touching the needle valve. Now adjust slightly until they roll in synchronization, and now you're ready to go. There are no tricks at all to flying the airplane. If you use this procedure, the outboard engine will quit first and you can fly on the inboard side. It will fly well on either engine so don't worry which dies first. One engine out means less pull and less speed but no loss in control at all. (Remember that low wing loading.) And when it's going on one engine and that quits, the bottom won't fall out; it will glide out fine. The best props so far have been 9-6 Power props with the tips clipped 1/4 in. on each end and the blade narrowed about 1/8 in. It'll just break 61 mph on 52 ft. lines. END


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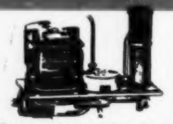

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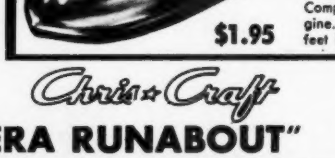

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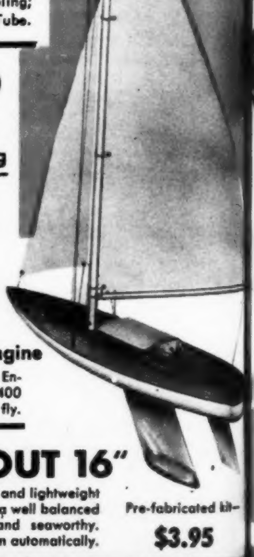

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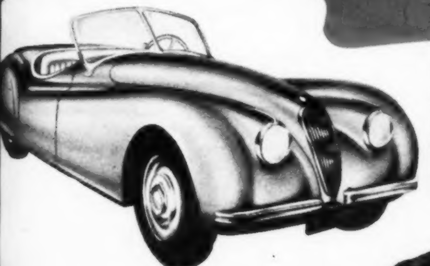

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